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Final Report

A Mid-Term Evaluation of the Canada/New Brunswick Conservation and Renewable Energy Demonstration Agreement

Prepared for

New Brunswick Energy Secretariat
Energy, Mines and Resources Canada

July 1983

CEDSI INCORPORATED
Canadian Energy Development Systems International
1729 Bank Street, suite 209, Ottawa, Ontario K1V 7Z5
Telephone 613 733 2100 Telex 053 4152

August 22, 1983

Mr. John L. Williamson
Deputy Minister
New Brunswick Energy Secretariat
Box 6000
Fredericton, N.B.
E3B 5H1

Dear Mr. Williamson:

It is with pleasure that we submit the Final Report of the Mid-Term Evaluation of the New Brunswick/Canada Conservation and Renewable Energy Demonstration Agreement (CREDA). Overall, we must commend you and the staff at the Energy Secretariat for a well rationalized and efficiently operated Program.

We have attempted to reflect this view throughout the report, while because this is a mid-term evaluation, emphasizing improvements which can be made in the time remaining in the Agreement.

As we are all aware there is some uncertainty concerning the final date of the Agreement and in our recommendations we present three options which may be pursued.

1. A termination date of March 1984.
2. A termination date of September 1986.
3. A termination date of March 1989.

Each of these options requires a different orientation toward the development (or wind-down) of the Agreement. These have been explained more fully in the final section. Our concluding recommendation is for extension of the program to September 1986.

Many thanks for the cooperation and hospitality we have been accorded both within the Secretariat and the Province.

Yours very truly,

Stephen S. Graham
Vice President

SSG:dr
Encls.

FINAL REPORT

A MID-TERM EVALUATION OF THE CANADA/NEW BRUNSWICK CONSERVATION AND RENEWABLE ENERGY DEMONSTRATION AGREEMENT

CEDSI INC.

JULY, 1983

SUMMARY

The Canada/New Brunswick Conservation and Renewable Energy Demonstration Agreement (CREDA) was signed January 16, 1980. It provides for the expenditure of $11,250,000 between January 16, 1980 and March 31, 1984 in order

(a) to develop and demonstrate promising new technologies which exploit renewable energy resources, conserve energy, or make its use more efficient; and

(b) to develop public awareness of renewable energy and energy conservation technologies

The allocation and disbursement of program funds (provided 80% by Canada and 20% by New Brunswick) is the responsibility of a federal/provincial Management Committee. Implementation of the program is the responsibility of the New Brunswick Energy Secretariat.

One requirement of the Agreement is that an impartial mid-term evaluation of the program be conducted to ensure that it meets the objectives of both governments. CEDSI was selected in May 1983 to undertake this evaluation.

The overall evaluation of the consultants is that CREDA has evolved in three and a half years into a well-run program. Staff expertise has increased significantly and the CREDA personnel have a sophisticated understanding of the demonstration process.

Project cycles show similar improvements. Discussions with federal officials show the New Brunswick Program to be exemplary particularly in the number and scope of projects funded to date, the evolution of the wood subprogram and the implementation of the information transfer component. Recommendations for improving the administrative aspects of CREDA New Brunswick are presented as mid-term recommendations for improving a well-

run program; these are detailed in the latter part of the summary and in the body of the report.

An important point raised by this study is the significant impacts that "externalities" (such as economic climate, availability of capital, the price of oil, degree of provincial support) have had both on the impact of the program and on the orientation of the objectives of the Agreement. The full impact of these externalities on the program has not yet been felt, and uncertainties therefore remain as to the ultimate effectiveness of CREDA in the long term.

The consultants have thus been faced with the dilemma of making recommendations for a program which administratively has set high standards but for which the full impact has yet to be demonstrated. Based on a review of the program, the following three possible scenarios for the future direction of CREDA were developed:

1) Termination of the Agreement March 31, 1984 (status quo).
2) Extension of the Agreement until September 30, 1986 followed by a six month administrative "clean-up" period; no new funds would be committed above and beyond the $11,250,000 provided through the existing Agreement.
3) Full scale extension of the Agreement, e.g. extension for another five years, with additional funds (perhaps in the order of $10 million).

The second option is recommmended for the following reasons:

a) Final reports and information transfer from the majority of New Brunswick CREDA projects will not be completed by March 31, 1984. The first two years of CREDA were largely occupied with developing the staff, expertise and administrative structure necessary to effectively implement the program. Thus a

considerable investment has been made, from which benefits are only now being realized. An extension of two and a half years, requiring no additional commitment of funds, should be sufficient to allow the majority of these benefits to be achieved.

b) Very little information is available on the impacts and effectiveness of CREDA to date, both because the majority of projects are incomplete, and because mechanisms have not been put in place to collect the data required to evaluate CREDA's performance. In light of this, a cautious approach is advisable. It would seem unwise to recommend that CREDA be continued in its present form for a time period longer that that required to complete work which has already begun and produce sufficient information for a quantitative evaluation.

c) The potential effectiveness of CREDA appears to be limited by barriers to technology commercialization which are beyond the ability of a demonstration program to remove. Under these circumstances, it is questionable whether CREDA should be continued in its present form for a lengthy period of time. A thirty-month extension, however, should permit commitments made under the current Agreement to be properly met, allow data to be assembled for a quantitative evaluation of the program's effectiveness, and provide time to assess the possibility of developing further mechanisms to deal with non-informational barriers to commercialization.

Thus a thirty-month extension with no additional allocation of funds appears to be the most appropriate response to the current situation of the New Brunswick CREDA program. Recommendations on how to implement this option in order to achieve maximum benefits are summarized briefly below.

1) Financial Planning

Priority should be given to immediate and detailed budgetting for all activities to be undertaken during the time frame of the Agreement.

2) Additional Projects

a) Additional projects should be approved only if funds remain after the budget requirements of current projects, administration, monitoring and information transfer have been defined and funds allocated. In the approval of new projects, priority should be given to the remaining projects listed in the Wood Energy Subprogram Plan as being necessary for completion of the Plan.

b) If additional funds remain, preference should be given to projects in the other two priority subprograms of heat recovery and retrofit. Before any such projects are approved, however, formal plans should be drawn up for these subprograms by the Energy Secretariat and approved by Management Committee. These plans should include clear definition of objectives, priority target audiences and apparent barriers to diffusion, and should rank technologies and markets so that priority can be given to funding projects for which market pull and potential for success appear to be greatest. Criteria for project selection and funding should be clearly defined for each subprogram, and detailed subprogram information transfer plans should be formulated.

c) Additional projects should only be approved if Management Committee is satisfied that their full project cycles can be completed within the specified time frame of the Agreement.

d) During the project preparation phase of each demonstration, subject to the requirements of confidentiality for unsolicited proposals, a representative sample of the primary target audience should be contacted for comments on the proposed project and suggestions on particular issues which the project should address.

e) Comprehensive information plans should be developed and budgetted for each project during the project preparation phase, coordinated where appropriate with subprogram information plans.

f) Project contracts should clearly state that proponents must consult with the Energy Secretariat prior to spending any information transfer funds, and contract format should be reviewed by legal experts.

3) Information Transfer

For existing projects, completion of planning for final report production and information transfer should be given priority. Information should be disseminated from non-viable demonstrations as well as successful demonstrations.

4) Staffing

It is likely that more information staff will be required as the orientation of the program shifts from the engineering/technical orientation of the early project stages of construction and monitoring to an increased emphasis on information. At least one full-time information specialist (preferably with a background in marketing) should be hired.

5) Data Collection

This evaluation was hampered by the lack of quantitative data on program and project outputs and effects. Systems to produce the data needed to perform a meaningful final evaluation should be put in place immediately. Basically this requires more attention to recording and following-up visits, inquiries (both to CREDA and related programs) and seminars.

6) Final Evaluation

The final evaluation referred to in the present Agreement should be deferred at least until March 1986.

7) Barriers to Commercialization

It is recommended that the federal government actively consider carrying out comprehensive market studies to identify the major barriers to commercialization of conservation and renewable energy technologies, and developing additional new policy instruments to address these barriers. The extension of the current program for 30 months provides a sufficient period for policy analysis such that by the time the final evaluation is carried out in 1986, substantive recommendations concerning the termination, continuation or modification of CREDA can be made.

A comprehensive evaluation of the program administration was carried out. A selected sample of 23 projects was reviewed in detail in order to identify and document common strengths and weaknessess in the project cycle, to list problems, results and experience, and to assess program implications. Project proponents were interviewed, and extensive discussions were held with provincial and federal CREDA staff.

CREDA activities were reviewed in the context of the project cycle - the phases of activity through which a project proceeds from inception to completion. Each project, regardless of its scope, passes through three principal phases: initiation (proposal assessment), planning (project preparation) and implementation (construction, monitoring and information transfer).

The manner in which the Energy Secretariat, as the CREDA implementing agency, administers all stages of the project cycle has become increasingly sophisticated as the program has developed. When CREDA first began in New Brunswick, as elsewhere, there was considerable uncertainty about the quantity and quality of proposals which could be anticipated. Thus proposal assessment criteria were limited; if a project appeared to have a reasonable chance of technical success and fit within the general guidelines of the Agreement, it was likely to be funded. Assessment criteria focussed mainly on the technical and administrative concerns of the program.

As the program proceeded and the quantity and quality of proposals received by the Secretariat increased, so too did the need to improve the project selection process. In early 1982 the Secretariat developed a Planning Document which identified three priority areas: waste heat recovery, wood, and energy efficient construction and retrofit in the residential, commercial and institutional sectors. These technologies were identified as being most appropriate to New Brunswick's climate, economic circumstances, and energy supply mix; following their identification, sub-programs were developed in each priority area.

Thus the proposal assessment procedure has positively evolved to give priority to technologies for which the chance of successful diffusion is greatest. However, there appear to be several weaknesses remaining in the proposal assessment/project selection process, weaknesses which are due primarily to a lack of clear definition of project objectives and selection criteria.

Federal and provincial CREDA staff appear at times to be evaluating proposals according to different criteria, and since selection criteria have not been clearly defined by either group, delays due to differences of opinion frequently develop. In particular, perceptions of project risk and appropriate funding levels differ, reflecting in part the conservative and risk-adverse nature of many New Brunswick proponents. Confusion as to whether projects should be technically or market-oriented further contributes to uncertainties and delays in proposal assessment.

Delays and frustrations at this stage of the project cycle would be considerably reduced if federal and provincial CREDA representatives were to attempt to clearly state and mutually agree upon criteria for project selection and funding. More attention should also be given to clearly defining the objectives of the three priority sub-programs (and of projects within them) as technical or marketing.

"Project preparation" refers to the planning stage of the project cycle in which approved proposals are developed into implementable projects. It is at this stage that preconditions for success must be built into a demonstation project -- the target audience identified during the proposal assessment stage should be involved, possible risks must be identified and contingencies developed, cost-sharing arrangements finalized, and management procedures put in place.

In this phase, as in the phase of proposal assessment, the New Brunswick CREDA program has evolved from an initial period of "learning by doing" to a cohesive, structured and organized approach. Unfortunately, however, involvement of the target audience has not always been possible because of the need to maintain the confidentiality of unsolicited proposals.

The sophistication of project implementation has also increased as the Energy Secretariat's planning and administrative capabilities have evolved. Throughout the program, a positive factor in project implementation has been the conscientious attention given to site visits and inspections; it is largely due to this that so few problems have developed during project construction.

In the early stages of the New Brunswick CREDA program, monitoring did not appear to receive a great deal of emphasis, and it was generally left to the proponent to plan and carry out the work. However, as projects progressed it became increasingly obvious that a number of project proponents had neither the interest nor the competence to design and implement effective performance monitoring plans. The Energy Secretariat

responded by hiring a monitoring engineer to develop project - specific monitoring plans, encouraging the use of consultants in cases where proponents lacked the necessary skills to implement the plans, and securing approval from Management Committee to allocate specific budgets for monitoring within overall program funding.

As a result, the monitoring of projects is now well managed and coordinated. However, the confusion surrounding monitoring in the early stages of the program has resulted in delays in the completion of many projects as monitoring is belatedly carried out. In addition, the continued approval of new projects at this late date in the program means that monitoring cannot be properly completed for at least 20 projects by March 31, 1984.

A similar problem exists with respect to project reporting. Final reports are central to the process of information transfer — potential replicators want to see written results before making investment decisions. However, at least 30 final reports will not have been received by the Energy Secretariat when the Agreement ends March 31, 1984.

Until recently, Management Committee was proceeding under the impression that project work could continue until September 30, 1984. This is not the case, however. Early in 1983, Management Committee was advised by EMR that the "grace period" described in Clause 5.11 of the Agreement applies only to the payment of progress claims received between April 1 and September 30, 1984 for work completed on or before March 31, 1984. Thus if the March 31, 1984 termination date is adhered to, the majority of project final reports will not have been received. This will naturally impact on the effectiveness of information transfer.

There has been a good appreciation from the beginning of the New Brunswick CREDA program of the importance of information transfer. However, the fact that an information officer was not hired until nearly a year after the program started meant that front-end planning suffered. Despite this, the

Secretariat's handling of the operational aspects of information transfer has been exemplary, and New Brunswick's information materials have been used as models by several other CREDA provinces. Delays in press release approval by EMR have caused considerable provincial frustration, but otherwise information transfer has proceeded well, and a high level of media response has been generated. The production of a wide variety of informational material is especially commendable given that New Brunswick is the only province which produces all its CREDA related printed matter in both official languages and which provides simultaneous translation services at seminars.

There has also been an evolution in the allocation of responsibilities for information transfer. In the early stages of the program, responsibility for this role rested largely with proponent. However, it soon became apparent that, as with performance monitoring, many proponents lacked the necessary competence in, and commitment to, information transfer. Modification of contract procedures to provide 100% of information transfer money through CREDA and the hiring of more information staff have given the Secretariat more control over information transfer and reduced problems during this phase. Modification of contract format to require proponents to consult with the Secretariat prior to disbursement of information transfer funds would further reduce the possibility of problems occurring during this phase.

The major problem with respect to information is thus that of the time constraint. If the Agreement ends March 31, 1984, much of the most valuable information transfer work -- the dissemination of project results -- cannot be carried out.

In addition to analysing the project cycle of the New Brunswick CREDA program, the consultants also reviewed the status of existing projects.

As of May 31, 1983, some $8,849,044 (or 79%) of the total available funds of $11,250,000 had been allocated for projects, monitoring, information transfer and administration; some $4,883,834 (or 43%) of this had been spent.

Emphasis given to projects in the three priority subprograms has varied — the emphasis on heat recovery projects has been constant, while the priority accorded to retrofit has been increasing, and retrofit projects now account for the largest proportion of approved project funds. Wood projects proliferated in 1981, and while the relative level of funding devoted to wood has declined somewhat since then, projects in this subprogram still account for the largest portion of project funding. The priority given to solar and general conservation projects has decreased since the early stages of the program.

The emphasis being put on retrofit projects is of some concern in light of the fact that there is no written plan for this subprogram. Subprogram objectives and criteria for project selection have not been clearly stated. In the absence of a written plan, the prevailing aim appears to be to "cover all bases" rather than to select and concentrate on those sectors in which retrofits appear to have the greatest potential to achieve cost-effective energy savings. Retrofit projects where the target market and need for a demonstration were clearly identified (e.g. Ducted Propulsion System, Arena Retrofits) have been highly successful to date. Other projects (e.g. Convenience Store and Restaurant retrofits) have been experiencing difficulties in start-up. These problems are due in part to a lack of clarification of the real needs of the target audiences involved. If more projects are contemplated under this subprogram, a detailed retrofit plan which includes provision for market studies to establish sectors in which there is a need for retrofit demonstrations should be developed and approved by Management Committee.

Similarly in the heat recovery subprogram, there is a need for more emphasis on identifying the real needs of the potential market and on orienting demonstrations and information transfer plans accordingly. The draft plan of action for the heat recovery subprogram currently focusses almost entirely on technical considerations.

The wood subprogram is better defined than the other priority subprograms and its plan has been approved by Management Committee. A particular strength of this subprogram is that it attempts to identify and address barriers to diffusion beyond the information barriers typically addressed by demonstrations. The subprogram is not concerned solely with energy: the economic, employment and silvicultural benefits to the forest industry are integral components of the wood energy strategy. The hiring of an experienced professional forester to manage the subprogram has provided project proponents with a source of technical advice and ensured that sub - program activities complement New Brunswick forestry policy.

Yet another strong point of the wood subprogram is that it focusses on a select range of technologies (i.e. those related to the production and consumption of wood chips) which appear to have the greatest current potential for economic application. The wood subprogram is also the only subprogram with an information transfer plan (although the Secretariat intends to develop similar plans for retrofit and heat recovery if time permits).

A factor that distinguishes the wood subprogram from the other priority subprograms is the manner in which its projects are interrelated. Supply and harvesting projects are necessary preconditions to replication of combustion projects; an arena retrofit is not, on the other hand, a necessary precondition to retrofitting of a restaurant. The heat recovery and retrofit projects can stand on their own in a way that the wood projects cannot, and the wood subprogram appears to require the completion of all its projects in order to maintain the integrity of the subprogram. The consequences of the March 31, 1984 termination date will therefore be more severe for the wood subprogram.

Generally speaking, renewable energy sources other than wood and other biomass are no longer a priority for CREDA. This appears to be an appropriate response to the poor economics of active solar systems in the

New Brunswick climate and of wind and hydro in a province with comparatively low electricity rates and relatively few remote locations. Conservation projects which do not fit into one of the priority subprograms are considered and approved on their own merits.

The small scale subprogram was developed to deal efficiently with small project requests. Its main objectives are to increase general public awareness and adoption of conservation and renewable energy technologies. It is difficult to determine what impact the subprogram will have on adoption of energy technologies, but it seems to have generated a considerable level of public awareness relative to the small dollar investment involved.

The CREDA program in New Brunswick, as elsewhere, is not suffciently advanced to permit a comprehensive evaluation of its impact. Only a handful of projects have been completed, and thus considerable replication cannot be expected to have taken place. However, it is possible, based on the review of project cycles and status, to subjectively assess the degree to which the New Brunswick CREDA program has established preconditions and employed strategies which have been found to increase the potential for demonstration success.

A subjective review indicates that New Brunswick CREDA program has generally been organized and administered in such a way that the potential for demonstration success is good. Quantitative evaluation of the degree to which this success has been achieved is hampered, as noted earlier, by the fact that few projects are complete. It is also constrained by the fact that mechanisms for gathering data on the impact of projects and on repliaction have not generally been built into projects, and thus the data necessary for a quantitative assessement are not available.

Nevertheless, an attempt was made to measure operational outputs, program outputs and program effects. While ultimate gross energy impacts will

depend on replication rates, the total expected annual energy impact of the projects themselves amounts to some 648,615 GJ of energy conserved or substituted. Of this, 514,126 GJ represents petroleum products (equivalent to 84,021 barrels of crude oil); 0.5% of New Brunswick's oil substitution goal has thus been achieved directly by CREDA projects. Job creation impacts are difficult to assess, but an order-of-magnitude estimate suggests that some 136 person-years of temporary employment were created in the implementation and administration of CREDA projects. One technology developed under CREDA (Energy Blanket) has achieved substantial market penetration, and at least two others (the WOODCAN stoker and the Arvin Chipper) appear to have considerable commercial potential.

Significant energy and long-term employment impacts are of course contingent on replication of the projects. Some 5 projects are known to have been replicated to date; since there is no system for tracing replications, there may indeed be other instances which have not come to the attention of CREDA staff or project proponents. Significant replication of wood supply and distribution activities would appear to offer the greatest potential for creation of new permanent employment. New Brunswick's wood projects have generated considerable national and international interest, and have been visited by government representatives from France and Portugal.

The New Brunswick CREDA program has established many of the preconditions for demonstration success. However, the impact of a program is not wholly determined by the manner in which it is planned and implemented: a number of externalities will influence both the way the program is run and the ultimate replication activity it generates.

External factors which have influenced the New Brunswick CREDA program include a relative lack of provincial activity and policy in conservation and renewable energy outside CREDA, economic recession, fluctuating prices of competing conventional fuels, and time constraints. The poor economic climate in particular has intensified the risk-adversiveness of potential

proponents and replicators, increasing the level of CREDA subsidy demanded by proponents and decreasing the potential for unsubsidized replication activity.

Time constraints have also been more severe in New Brunswick because considerable time was needed to build up the infrastructure and expertise which were already present in provinices with established energy departments.

The implementation and effectiveness of CREDA is also influenced by the existence of barriers to the diffusion of conservation and renewable energy technologies which are beyond the mandate and scope of the program to address.

Financial constraints appear to be particularly strong barriers to replication in New Brunswick. This creates a dilemma for CREDA because the paybacks considered acceptable by private investors are considerably shorter than those considered reasonable from a social point of view. Thus demonstration of a number of promising energy technologies appears unlikely to result in significant levels of replication unless mechanisms exist to reduce (through loans or subsidies) these financial barriers.

Public and private financing mechanisms currently available (e.g. NEAP AECIP, Canercon, private loans and mortgages) appear to be fragmented and sector-specific. While CREDA has coordinated with other federal and New Brunswick departments and programs where possible, it is doubtful whether these existing programs are sufficient to address the financial barriers to replication of many projects.

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1.0 THE STUDY CONTEXT

1.1 Background

On March 29, 1983, Canadian Energy Development Systems International (CEDSI Inc.) received a Call for Proposals from the New Brunswick Energy Secretariat, for an interim evaluation of the Canada/New Brunswick Conservation and Renewable Energy Demonstration Agreement (CREDA). The requirement for an interim evaluation is contained in Clause 9.2 of the Agreement, which states:

"The Management Committee will conduct, or cause to be conducted, within two years of the signing of this Agreement an evaluation of the effectiveness of the program to ensure that it meets the objectives of both governments in this Agreement."

According to the Call for Proposals, the evaluation was delayed by mutual consent of both parties to the Agreement, through the Management Committee, "because substantive implementation of the agreement took longer than had originally been expected."

The detailed Terms of Reference governing the evaluation are included in Appendix A.

On April 15, 1983, CEDSI submitted an offer of services in response to the request. In May, 1983, the firm was advised that it had been selected to undertake the evaluation.

This report presents the findings of the interim evaluation.

1.2 Objectives

The general objective of the study is to evaluate in an impartial manner the effectiveness of the program in meeting the objectives of both governments as outlined in the Agreement. Within this context, several specific objectives can be identified:

- identify and describe objectives of the Agreement, Program and Projects;
- assess the extent to which these objectives are being achieved, through review and analysis of the impacts of projects to date and expected future impacts;
- determine whether there are more cost-effective ways of achieving these objectives;
- identify factors contributing to success and/or failure, as appropriate, in meeting objectives;
- recommend changes in program structure and operation which could increase its effectiveness.

1.3 Background and Objectives of CREDA

The Canada/New Brunswick Conservation and Renewable Energy Demonstration Agreement (CREDA) was signed January 16, 1980. It provides for the expenditure of $11,250,000 between January 16, 1980 and March 31, 1984, in order:

"(a) to develop and demonstrate promising new technologies which exploit renewable energy resources, conserve energy, or make its use more efficient; and

(b) to develop public awareness of renewable energy and energy conservation technologies."

The allocation and disbursement of Program funds (provided 80% by Canada and 20% by New Brunswick) is the responsibility of a federal/provincial Management Committee. Implementation of the program is the responsibility of the New Brunswick Energy Secretariat. Section 2.3 of the Agreement states that Agreement "objectives are to be accomplished by carrying out Projects in the areas of:

(a) renewable energy resources development and demonstration; and

(b) energy conservation development and demonstration."

The objectives as outlined in the Agreement are somewhat vague and all-encompassing. Based on discussions with senior federal and provincial CREDA officials, it must be assumed that the ultimate aim of CREDA is not merely to "develop and demonstrate" innovative technologies of conservation and renewable energy, but to accelerate by these means the commercialization and diffusion of these technologies.

1.4 Demonstrations: A Conceptual Overview

Within different contexts the term "demonstration" has been used to describe:

- the bridge between R&D and commercialization;
- a means of accelerating the commercialization of new products or processes;
- the final phase of an R&D Process;

- the specific advancement of a technology through the field testing of an innovative product or process;

- a tool to accelerate the commercial application of economically and socially desirable innovations;

- the final stage of "scaling up" from the laboratory to commercial use.

Clearly, a functional definition of "demonstrations" is only possible within the context of a specific application.

The determination of the need for a demonstration is the first and most important step in the planning process. In order to adequately resolve the question of "why a demonstration?", there must be a clear understanding of the purpose of the demonstration. The objectives must be explicitly stated, understood and agreed upon. The problem of varied perceptions and expectations results from a lack of consensus at this point and can lead to considerable problems later in the project cycle.

Different objectives require different types of demonstration projects. In establishing the objective of a demonstration it is useful to examine the state of a technology to determine whether a technical or a marketing demonstration is required.

In general, demonstrations can be categorized as one of three types: technical, marketing, or strategy. Technology demonstrations are designed to determine the in-use performance capabilities and operating costs of new products/processes. They may or may not be the final phase of a R&D effort, but the objective is clearly to collect, analyze and disseminate performance data in order to show technical feasibility. Their targets are policy makers, manufacturers, and equipment users. Information is not generally disseminated to the consuming public.

On the other hand, the objective of marketing demonstrations is to collect, analyse, and disseminate data regarding economic feasibility. Such demonstrations are targeted at consumers and information pertaining to them should be widespread, since this is the manner by which public interest in and acceptance of a new technology is generated. Table 1.1 presents a comparison of technical versus marketing demonstrations.

TABLE 1.1

A Comparison of Technical & Marketing Demonstrations

	Technical Demo	Marketing Demo
Audience	- Sponsors	- Customers
Project Design Objectives	- Low visibility	- High visibility
	- Quantitative control and evaluation	- Sufficient control for credibility
	- Simulated pertinent environment	- Full operational environment
	- Smallest scale to get information	- Fullest scale to approximate reality
Management Posture	- Healthy skepticism	- Optimistic assurance

Source: U.S. Dept. of Energy, Assistant Secr. for Resource Applications, The Demonstration Project as a Procedure for Accelerating the Application of New Technology, (Charpie Task Force Report) DOE/RA-0003/1, Washington D.C., Feb. 1978, Vol. 1. pg. 15.

Strategy demonstrations involve the use of instructional or educational techniques to achieve policy objectives. Unlike technical and marketing demonstrations, strategy demonstrations do not necessarily involve technological innovation. Instead they involve changes in the patterns of use of existing technologies.

The determination of which type of demonstration is required under a given set of circumstances is critically important. A marketing demonstration of an insufficiently proven technology will almost always fail.

An important objective of the majority of demonstrations is the production of information, in order to reduce uncertainties about the various consequences (technical, economic, institutional, etc.) of adoption of a new technology. This characteristic can provide a basis for assessing the "success" of a demonstration. In its 1976 Analysis of Federally Funded Demonstration Projects: Final Report for the Experimental Technology Incentives Program of the U.S. Department of Commerce, the Rand Corporation defined three distinct measures of demonstration outcomes:

- A demonstration is an **information success** when, as a result of the project's activities, uncertainties about the operation of the technology in a real-world setting are reduced to the point where potential adopters are able to decide whether or not to adopt, and regulators are able to decide whether or how to regulate.

- A demonstration is an **application success** to the extent that the project meets the expectations of local adopters and users with respect to the quality and reliability of the output.

- A demonstration is a **diffusion success*** to the extent that the technology passes into use as a result of the activity.

* Rand defined "adoption" as the decision by an individual or organization to use the new technology, and "diffusion" as the process of adoption over time within a particular industry or economic sector.

A demonstration which is an information success may not succeed in leading to application and diffusion. There are barriers to success present at each stage of the processes of demonstration and commercialization. A successful demonstration must identify these factors, and find ways of overcoming them. In preparing the demonstration plan, the capacity to identify these barriers should be ensured, i.e. barriers should be studied during the planning stage.

Barriers to the successful adoption of new technologies can take several forms. It should be recognized that society has established institutions to support existing products and their use patterns - often to the detriment of innovation. Demonstrations are intended to overcome much of this resistance to the acceptance of innovation. All demonstrations are designed to achieve social objectives through persuasion of the appropriate public to adopt innovation. It is recognized that innovation changes the established order, and that new technologies must compete with existing products and processes.

The first step in reducing resistance to adoption of a new technology is to establish technical viability through a technical demonstration. Once this has been accomplished other barriers to adoption of the technology must be identified. Common barriers to adoption include:

- lack of information; the target audience may not be aware of the potential benefits (stated in practical terms) which adoption of the innovation would produce. A marketing demonstration should remove this barrier.

- financial constraints; in a weak economy potential adopters will typically be risk adversive. In addition, conserving cash flow in a period of tight credit conditions is given high priority.

- Institutional barriers; decision makers may constitute a different target apart from "users". The consensus of a number of

organizational bodies may be required. Implementing agencies may lack the expertise and experience to effectively assist proponents.

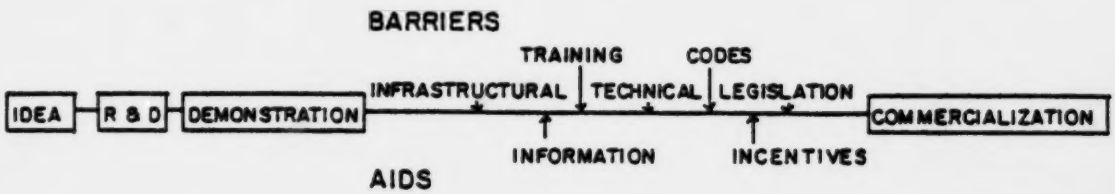
- environmental barriers; the development of resources may create undesirable impacts which are unknown. This may slow the process of adoption.

- timing and commercial viability; for those who adopt a technology at an early stage the cost of conversion may be high since the scale of economies which can result from mass production (in response to higher demand) is not yet available.

- lack of an established after market service structure or supply infrastructure.

Many of these barriers involve an element of time. There is commonly a considerable amount of trial and error involved in the process of technological innovation, which results in reluctance toward early adoption among potential users of a new technology. A major objective of demonstrations is thus to accelerate the process of adoption, by anticipating potential barriers and ensuring that mechanisms are in place to circumvent them.

The following line chart shows graphically where demonstrations fit within the chain of R&D to commercialization and some of the barriers this process encounters.



The Rand Corporation identified eight conditions which have been shown to increase the potential for success in demonstrations:

(1) the major, technological problems had been resolved beforehand;

(2) the program costs (and therefore risks) had been shared with local participants;

(3) the initial concept or project idea had originated at the local level;

(4) there already existed a market for products or processes similar to the innovation;

(5) all the elements for commercializing the innovation including manufacturers, purchasers, regulators, etc., had participated in the planning and implementation of the project;

(6) there had been only limited or no external time constraints;

(7) the technology was easily reproduced from site to site;

(8) only limited cooperation was required among different elements within the institutional environment.

If a demonstration satisfies these basic preconditions, the barriers outlined above are likely to be greatly reduced. Thus the success of a demonstration project is directly related to the level of effort committed at the project planning stage to identifying target audiences and potential barriers to replication.

The preconditions in themselves are, of course, not necessarily sufficient to ensure the success of demonstrations. The types of strategy developed to implement the program are also important.

The Rand Corporation study identified six strategies which have been shown to increase the potential for successful demonstrations:

1. Include explicit plans for follow through after the demonstration. This involves building an in-house staff with marketing as well as technical experience.

2. Conduct the demonstration on as small a scale and with as little initial visibility as possible*.

3. Conduct several demonstrations in parallel, addressing the same problem, if budgetary constraints will allow.

4. Do not emphasize large projects at the expense of small ones involving incremental improvements to existing products or processess.

5. Resist political pressure to demonstrate before a technology is well in hand.

6. Allow enough time in a demonstration's schedule for slippage, especially when undertaking large projects with significant technological uncertainty.

The importance of detailed demonstration project preparation and planning cannot be overstated. Generally demonstrations are highly sensitive; they frequently have a high public profile, they involve private sector participants who may have made significant financial contributions and they involve innovative elements which by definition include a risk element. Effective planning and preparation can minimize this risk by recognizing potential barriers to implementation and by formulating proactive responses to them.

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* This strategy applies primarily to technical demonstrations.

A demonstration project must begin with a strategic decision to include the project based first on the need for a demonstration, and second an assessment of the obstacles to adoption of the innovation. This, in turn, will lead to a decision on the type of demonstration project which is required and a well articulated statement of both project objectives and tasks/activities required to achieve these objectives. This process is summarized in Figure 1.1.

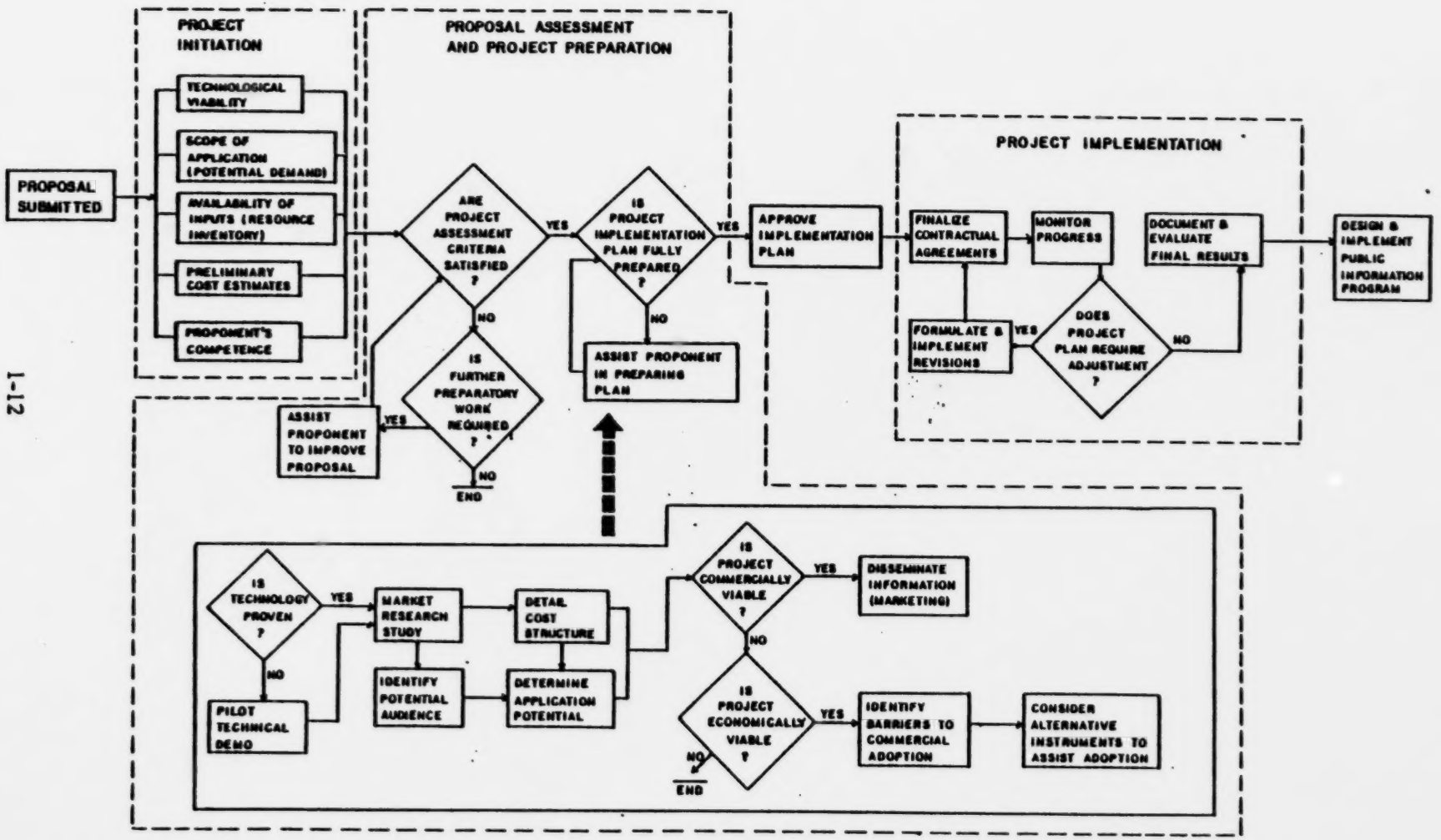
1.5 The Evaluation Methodology

The evaluation of CREDA presents unique challenges in that the "success" of a demonstration program can only be ascertained over the long term. The degree of independent replication of the demonstration projects ("diffusion") is typically used as a measure of success, but such replication activity requires time. The absence of replication may not indicate "failure"; rather, it may indicate that the demonstration process is not sufficiently advanced to have resulted in diffusion of the technology.

The methodology of an interim evaluation must take this fact into account. However, while it may not be feasible to measure replication, it is possible to determine whether the demonstration program has been successful in establishing the basic preconditions which will facilitate diffusion. Eight principal preconditions for successful demonstrations were discussed in Section 1.4.

It is obvious that the CREDA program in New Brunswick is not sufficiently advanced to permit evaluation of success using actual replication as a criterion. Only a handful of projects have been completed and while sporadic instances of replication can be cited, in general, insufficient information is available to permit any sort of quantitative assessment of diffusion. Thus the four quantitative methods of analysis discussed in CEDSI's Offer of Services (namely benefit-cost analysis, program impact analysis, cost-effectiveness analysis and impacts/achievement matrix) are of limited use. Rather, the

Figure 1.1 **Conceptual Sequence of Project Activities**



evaluation methodology must focus on identifying the means by which progress has been made towards achievement of program objectives.

The investigation began with discussions with federal and provincial program personnel to develop an overview of program structure and objectives. This was followed by a brief review of the project "portfolio" and the role of individual projects within the context of the overall program, and by an examination of the various subprograms and priority areas. A selected sample of 22 projects was identified and a detailed review of these projects (including interviews with individual project managers) was undertaken. The purpose of the detailed investigation was to identify and document common strengths and weaknesses in the project cycle for each project, to list problems encountered, results and experience acquired, and to assess implications for the program as a whole and for the subprograms.

The information thus obtained was analysed to determine the degree to which project and program structure and activities have established the preconditions for demonstration success, taking into account the context in which the program has had to operate. Based on these findings, a series of proposed recommendations was developed.

1.6 Report Structure

The structure of the report reflects the necessity to evaluate the New Brunswick CREDA program in the context of what it could reasonably expect to achieve, given the limitations of the Agreement and the operational environment.

In Chapter 2, the New Brunswick CREDA project cycle is examined, to determine what has been done to establish the preconditions for demonstration success. Chapter 3 reviews the current status of the program and projects, highlighting achievements to date and lessons to be learned

from project experience. Chapter 4 examines the various factors influencing the degree to which the New Brunswick CREDA program could reasonably be expected to meet CREDA objectives — factors such as the relevance of the objectives themselves, the policy environment, externalities and other constraints, the impact of other government programs, etc. Finally, in Chapter 5, the performance of New Brunswick CREDA is evaluated against what it could be expected to have achieved, and recommendations are made on how the program should proceed.

2.0 THE PROJECT CYCLE: A REVIEW

2.1 Antecedents

The term "project cycle" refers to the phases of activity through which a project proceeds from inception to completion. The length of time and intensity of effort required by each phase and throughout the entire cycle is dependent on a number of factors, including investment size, level of risks, availability of information, etc. However, the major factor which determines the structure, level of detail and duration of the project cycle is the scope of the project objectives.

Regardless of its scope, each project passes through three principal phases: the initiation phase, the planning phase, and the implementation phase. In the initiation phase, the need for the project and the basis for involvement are considered, and objectives are articulated. In the context of CREDA, the initiation phase corresponds to the stage of proposal assessment. The planning phase establishes the framework for the project, including definition of activities, specification of management procedures, budgetary controls and time schedules, identification of possible risks and preparation of contingencies. The implementation phase includes procurements, contract negotiations, construction, site visits, monitoring, performance evaluation, documentation and report preparation, and dissemination or transfer of information. In the project cycle for demonstration projects, the third phase can be subdivided into construction, monitoring, reporting and information transfer, in order to reflect the particular importance of information.

In the following sections, the project cycle of the New Brunswick CREDA program is examined and analysed to determine the degree to which preconditions for successful demonstrations have been established.

2.2 Proposal Assessment

The objectives of the Agreement, as outlined in Section 1.3, are broad, and provide little guidance insofar as proposal assessment and project selection are concerned. However, Section 4.5 of the Agreement provides more direction, stating that "criteria for approving and selecting projects will include:

"(a) the Project must hold a reasonable promise of future cost effectiveness of the technology or process to be demonstrated;

(b) the project must be technically sound and have a reasonable chance of operating successfully;

(c) the Project should have potential benefits in relation to Canadian and New Brunswick energy, to industry, to trade and to the environment;

(d) the Applicant must possess the technical competence to carry out all phases of the Project;

(e) selection of Projects shall be such as to provide a wide coverage of the range of technologies involved in the two program areas;

(f) Projects will be selected so as to provide a wide geographical coverage so that as many New Brunswickers as possible may see these technologies in operation."

These criteria provide a sound basis for assessment and selection of proposals insofar as the technical and operational aspects of the program are concerned. These criteria were adequate during the early phases of CREDA given the environment in which the program was initiated. When CREDA first began in New Brunswick, as in other provinces, there was considerable uncertainty about the quantity and quality of proposals which could be

anticipated. If a project appeared to have a reasonable chance of technical success and fit within the general guidelines of the Agreement, it was likely to be funded. A review of "inactive proposals" received during 1980 revealed only three proposals rejected by the Energy Secretariat.

Thus in the early stages of CREDA, proposal assessment criteria were limited; the emphasis was on getting projects "up and running". In retrospect, this approach was appropriate given the limited staff, minimal administrative infrastructure and lack of subject area expertise in the Energy Secretariat. When CREDA was signed in January 1980, there appears to have been only limited capability in New Brunswick in the field of conservation and renewable energy. There was thus considerable incentive to get projects started and "learn by doing".

At the end of 1980, an information officer was hired for the Program, and gradually more attention was given to information as a consideration in proposal assessment. Routines were developed whereby proposals were circulated among Secretariat staff, to outside technical consultants when necessary, and to appropriate provincial departments and agencies. In this manner, proposals were reviewed from a variety of perspectives, and the recommendations received from these various parties were valuable additions to the proposal assessment process. In particular, provincial government departments concerned with a particular economic sector (e.g. forestry, fishing, agriculture) have been able to provide the Secretariat with a better appreciation of the needs of particular target markets.

To facilitate the proposal assessment process, a "Demonstration Project Proposal Evaluation" form was developed for the evaluation of proposals according to 15 criteria:

"1. Renewable Energy Demonstration.
2. Conservation Demonstration.
3. Relevance to New Brunswick.

4. Manufacturing Possibilities for New Brunswick.
5. Uniqueness in New Brunswick Region.
6. Potential Cost Effectiveness.
7. Feasibility of Idea.
8. Technical Capability of Applicant.
9. Experience in Similar Work.
10. Environmental Concerns.
11. Project Management Capability.
12. Reporting Provision.
13. Information Transfer.
14. Cost Estimate Soundness.
15. Completeness of Proposal."

While these criteria were important in rationalizing the proposal assessment process, they focussed mainly on the technical and administrative concerns of the program.

By early 1982, in the face of a steady stream of incoming inquiries and proposals* (see Table 2.2 for numbers of proposals reviewed per year), the Secretariat developed a general plan to outline criteria to govern the selection of demonstration projects during the second half of CREDA. While proposals had previously been considered on an unsolicited as-received basis, in the second half of CREDA the province wished to focus its attention on specific project ideas and locations. The "1982 Planning Document" produced by the province identified the following priority areas:

* All inquiries are not documented in Energy Secretariat files, but staff estimate that the ratio of inquiries to proposals is approximately 3 to 1.

"- Waste heat recovery projects in all sectors.
- Wood and other biomass related projects.
- Energy efficient construction and retrofit in the residential/commercial/institutional sectors."

Once these priority areas were identified, various subprograms were developed. (These are discussed in detail in Chapter 3). The development of the subprograms has increased the involvement of the Energy Secretariat in the generation of proposals and has focussed and "tightened up" the project selection process. The three technology areas identified are appropriate to New Brunswick's climate, economic circumstances, and energy supply mix.

There has thus been a clear evolution of the proposal assessment procedure from ad-hoc to more focussed selection. Technically and administratively, criteria have been defined which have facilitated the assessment and selection of technologies to be demonstrated and assured some degree of technical success downstream.

However, there appear to be several weaknesses remaining in the proposal assessment/project selection process. As the following discussion indicates, most of the problems in this phase stem from a lack of clear definition of project objectives and selection criteria.

The issue of proposal turnaround time was raised by a number of project proponents and provincial CREDA staff. Documentation is not available in many cases on dates of proposal submission, dates proposals were forwarded to Energy, Mines and Resources (EMR) and dates of approval, but a review of both accepted and rejected proposals for which adequate documentation is available produced the average turnaround times shown in Table 2.1.

TABLE 2.1

Average Turn-Around Times for Proposals

Year Submitted	Total No. of Proposals on File	No. of Proposals For Which Turn-Around Time Documented	Mean Turn-Around Time in Months	
			Energy Secretariat	EMR
1980	43	14	1.9	2.9
1981	54	26	1.8	2.3
1982	52	18	2.2	3.1

The combined turn-around times shown result in an average wait of three to five months for project proponents. Discussions with a number of proponents indicated that delays in the approval process can be problematical, especially when the CREDA project is only one component of a larger project and procurement processes are delayed. There appear to have been a number of instances when potential proponents "gave up" on their proposal because they could not wait any longer for a decision to be made.

Certainly proposal assessment requires time, especially for those proposals whose technical content requires review by several provincial and federal government departments. As matters currently stand, however, there appears to be considerable time spent by CREDA staff processing proposals which are subsequently either rejected by Management Committee, require extensive and time-consuming modifications, or have funding levels altered such that the proponent ultimately withdraws from the project (see Table 2.2). This results in frustration at all levels, and reduces the general efficiency of program administration.

TABLE 2.2

Inactive Proposals: Reasons for Status

Sector	Rejected By Energy Secretariat	Rejected By EMR or Management Committee	Proponent Withdrew	Referred To Small Scale	Total	Total # Proposals Approved	Rejection Rate (%)
Retrofit	4	3	2	2	11	13	45.8
Heat Recovery	5	4	6	2	17	11	60.7
General Conservation	7	14	12	2	35	8	81.4
Wood	6	4	6	2	18	14	56.3
Solar	6	-	5	1	12	4	75.0
Other Renewables	4	3	6	1	14	2	87.5
Total	32	28	37	10	107	52	67.3 (avg.)
%	29.9%	26.2%	34.6%	9.3%	100%		

The basis of the problem appears to be a lack of clearly defined and mutually agreed-upon criteria for proposal assessment. To a certain extent, this is a consequence of the broad scope of CREDA and the variety of technologies being demonstrated. For example, the federal review process is structured such that proposals are reviewed by sectoral experts (i.e. in industrial energy, buildings, biomass, etc.). Within each sector and program for conservation and renewable energy, different criteria and priorities may apply; sometimes these are explicitly stated, but often they are not. As a result, it is sometimes difficult for the federal CREDA office to clearly indicate to the province exactly what sorts of proposals are most likely to be approved.

Nevertheless, discussions with both federal and provincial CREDA representatives indicated that the difficulties encountered during the proposal assessment phase go beyond the normal negotiating delays which are to be expected in a federal/provincial program as broad as CREDA. In particular, the issue of appropriate funding levels appears to be of concern to both governments; for a variety of reasons provincial funding requests appear to frequently exceed levels considered appropriate by federal proposal reviewers. As a result, considerable delays can ensue while a mutually acceptable level of CREDA participation is negotiated.

The degree of project risk should be a major fact in determining appropriate funding levels. The difference in opinion between the federal and provincial governments may indicate that the province perceives conservation and renewable energy investments to be riskier than does the federal government. New Brunswick has generally been considered to be a "have not" province; given its rather poor economic climate, it is perhaps not surprising that proponents request higher levels of subsidy.

Ideally, the level of risk in a demonstration should be determined largely by the status of the technology involved. The more proven the technology, and the more information that is available on its performance under different circumstances, the lower the level of risk should be. Definition of risk is

important not only in determining funding, but also in planning the orientation of a demonstration, i.e. in determining whether a technical or a marketing demonstration is most appropriate.

A review of New Brunswick CREDA projects indicates that technical risk and demonstration objectives have frequently not been explicitly defined at the proposal assessment stage. Table 2.3 summarizes the characteristics of those CREDA projects which are well underway (excluding small-scale), and classifies them as either technical or marketing demonstrations. More than two-thirds of the projects shown have important characteristics of technical demonstrations (low profile, strict quantitative control), although most have been carried out on a full scale in an operational environment. All of the heat recovery projects resemble technical demonstrations, slightly more than half of the retrofit projects appear to be technical in nature, and all the wood projects appear to be either purely technical or technical/marketing demonstrations.

Insofar as the wood projects are concerned, a technical orientation is clearly appropriate. Wood chip combustion technology is still at the developmental stage, as are harvest and delivery systems. A number of uncertainties, and therefore risks, remain.

Retrofit technologies, on the other hand, are more proven, and one would therefore expect retrofit demonstrations to be predominantly market-oriented. This has not been the case, however. More than half the implemented retrofit projects are being conducted primarily as technical demonstrations.

Discussions with CREDA staff at the Energy Secretariat indicated that this technical focus is at least in part a response to the extreme conservatism of the target audience (primarily homeowners and small businesses). CREDA staff feel that the failure of even one high profile marketing demonstration would greatly increase this audience's resistance to innovation, and have

TABLE 2.3

Characteristics and Classification of New Brunswick CREDA Projects

PROJECT #	PROJECT CHARACTERISTICS												TYPE OF DEMO
	Audience		Visibility		Control		Environment		Scale		Management Posture		
	Sponsors	Customers	Low	High	Quantitative	Credibility	Simulated	Operational	Small	Full	Skeptical	Assurance	
2001		X		X		X		X		X		X	Marketing
2002		X	X			X		X		X		X	Marketing
2003	X	X	X		X		X	X	X		X		Technical
2004	X		X		X			X	X		X		Technical
2005	X		X		X			X		X	X		Technical
2006	X	X	X		X			X		X	X		Technical
2007	X		X		X			X		X	X		Technical
2009	X		X		X			X		X	X		Technical
2010	X		X		X			X	X		X		Technical
2012	X		X		X			X		X	X		Technical
2013	X		X		X			X		X	X	X	Technical
2014	X		X		X			X		X	X	X	Technical
2016		X	X			X		X		X		X	Marketing
2017	X	X		X		X		X		X		X	Marketing
2021		X	X	X	X			X		X		X	Marketing/ Technical
2023	X		X		X		X		X		X		Technical
2024	X	X		X	X			X		X	X		Marketing/ Technical
2027	X	X		X	X			X		X		X	Marketing

TABLE 2.3 (cont'd.)

PROJECT #	PROJECT CHARACTERISTICS												TYPE OF DEMO
	Audience		Visibility		Control		Environment		Scale		Management Posture		
	Sponsors	Customers	Low	High	Quantitative	Credibility	Simulated	Operational	Small	Full	Skeptical	Assurance	
2028		X	X			X		X		X	X		Technical/ Marketing
2029	X		X	X	X			X		X	X		Technical
2032	X		X		X			X		X		X	Technical
2034	X	X	X		X			X		X	X		Technical/ Marketing
2035		X		X	X			X		X		X	Marketing
2036	X		X		X			X		X		X	Technical
2037	X		X		X			X		X	X		Technical
2040	X		X		X		X		X		X		Technical
2042		X	X		X			X		X		X	Marketing
2043	X		X		X			X		X	X	X	Technical
2044	X		X		X			X		X		X	Technical
2045	X		X		X			X		X		X	Technical
2046	X		X		X			X		X		X	Technical
2047	X		X		X			X		X		X	Technical
2048	X		X		X			X		X		X	Technical
2049	X		X		X			X		X		X	Technical
2050	X		X		X			X		X	X		Technical

consequently chosen to take a low profile, highly controlled approach to many retrofit demonstrations.

This may well be an appropriate response to prevailing conditions in New Brunswick. There is a concern, however, that the low profile approach has not been clearly planned to meet the overall objectives of the retrofit subprogram. To date (as discussed in Section 3.2) there has been no written plan for this subprogram. While the Secretariat clearly has an "unwritten agenda" for retrofit projects, the crystallization of this agenda in written form would help to clearly indicate what types of projects should be done and why, and to make a clearer distinction between technical and marketing demonstrations.

Most New Brunswick CREDA heat recovery projects show a strong technical, rather than marketing, orientation. This was appropriate for the earlier heat recovery projects, because the concepts being demonstrated (waste heat aquaculture, surface heating of greenhouses) were novel. However, such an approach is not necessarily appropriate for projects demonstrating more proven technology such as heat pumps, swimming pool heat recovery, and so on.

In New Brunswick the technical, rather than marketing, orientation of heat recovery projects is reinforced by the Draft Heat Recovery Program Plan of Action developed in early 1982. The technologies suggested for demonstration are generally considered to be proven, and one would thus expect that the main focus of the Plan would be on identifying target markets and marketing strategies. However, the Plan concentrates on technical concerns and does not consider marketing objectives. No attempt is made, for example, to compare the relative economics of various systems or to set guidelines for assessment of proposals based on considerations of commercial viability. These considerations should be incorporated into the Plan before it receives Management Committee approval.

Thus the approach taken in selecting projects under the three priority subprograms has not always clearly taken into account the differences in objectives and requirements between technical and marketing demonstrations. Projects demonstrating proven technologies in retrofit and heat recovery should emphasize marketing considerations such as payback periods and evidence of market pull. The level of capital subsidy for such projects should be lower, to reflect the lower level of technical risk. If the identified target market indicates that there are strong barriers to replication other than lack of information (as high funding requests appear to indicate) the project in question should not be pursued unless feasible means of overcoming those barriers can be identified.*

In summary, there has been a positive evolution in the New Brunswick CREDA proposal assessment process, from a reactive and very broad approach in the early stages of the Program to a more systematic and focussed approach built around priority subprograms. There are some weaknesses, however, in the areas of objectives-setting and criteria for project selection. More attention should be given to clearly defining the objectives of the three priority subprograms (and of projects within them) as technical or marketing. If this is done, the criteria to be used in assessing proposals will be more clear (i.e. commercial viability is a more important consideration in marketing than in technical demonstrations; capital funding requests should be lower in marketing projects). An attempt should also be made by both the provincial and federal CREDA offices to clearly state and mutually agree upon these criteria at Management Committee in order to reduce the current misunderstandings and negotiating delays.

* The question of barriers to diffusion and their impact on CREDA generally, and on project selection in particular, is discussed further in Section 4.3.

2.3 Project Preparation

"Project preparation" refers to the planning stage of the project cycle in which approved proposals are developed into implementable projects. It is at this stage that preconditions for success must be built into a demonstration project -- the target audience identified during the proposal assessment stage must be involved, possible risks must be identified and contingencies developed, cost-sharing arrangements finalized, and management procedures put in place. The purpose of this phase of the project cycle is to establish the framework for implementation of the demonstration project. It is assumed that the need for the project has already been established in the proposal assessment phase.

In this phase, as in the proposal assessment phase, the New Brunswick CREDA program has evolved from an initial period of "learning by doing" to a more cohesive, structured, and organized approach to project preparation. Inexperience and limited staffing in the early stages of the program appear to have frequently resulted in insufficient attention to the details of financial and contractual arrangements, contingencies, and plans for monitoring and information transfer. This conclusion is borne out by a review of early project contracts (in which contradictions are frequent) and delays in project monitoring (see Sections 2.6).

Within the past year, however, an increase in staff (to include accounting, clerical, monitoring and more information personnel) and establishment of better defined administrative procedures has improved project preparation considerably. Contracts are more standardized, and more attention is given to planning and budgetting for monitoring and information transfer on a project-specific basis. Thus the mechanics of project preparation appear to have been streamlined and improved as the Secretariat has gained experience and built up its staff. Only one area was identified in the project preparation phase that required more emphasis and this was the involvement of the target audience in the planning phase.

The Rand Corporation defines a target audience as "a group of individuals or institutions whose decisions may be affected by the information produced by a demonstration, and whose decisions affect the diffusion or implementation of the technology". In most cases, the primary target audience is comprised of the potential adopters. The presence of members of the target audience in demonstrations, expecially as risk-bearers, is considered to be a good indicator of market interest in the technology. The involvement of potential replicators also tends to increase the chances that the demonstration will address the most important questions. If the objective of a demonstration is to produce information for target audiences, then it is important that members of the target audience be given the opportunity to express their needs before the demonstration is implemented. Ultimately, involvement of all target audiences will speed the dissemination process.

In the New Brunswick CREDA program the arena retrofits (wherein the involvement of the Department of Youth, Recreation and Cultural Services provided a clear link with the target audience) is a good example of target audience involvement. Considerable attention is given to target audiences during the information transfer phase of the project cycle (including identification of "primary" and "secondary" target audiences). For many other projects, however, it is clear that earlier identification and involvement of target audiences would greatly increase the chances of success of CREDA projects.

Involvement of the target audience has, however, not always been possible. As in other provinces, the New Brunswick CREDA Program was originally structured to react to unsolicited proposals rather than to solicit proposals. An unsolicited proposal must be considered confidential until a contract has been signed with the proponent and a press release issued. Because of this confidentiality consideration, it is difficult to involve the target audience prior to the project implementation stage.

2.4 Project Implementation

The success of project implementation is directly dependent on the level and quality of planning that has preceded the implementation phase. Thus it is not surprising to find evidence of increasing sophistication of implementation corresponding to the evolution in the Energy Secretariat's planning and administrative capabilities. Nowhere is this more clear than in the areas of monitoring and information transfer.

Throughout the program, a positive factor in project implementation has been the conscientious attention given to site visits and inspections. The fact that the Energy Secretariat has one staff member working virtually full time on this aspect of project implementation has enabled contact with proponents to be well maintained and problems pinpointed early. In addition, having a CREDA representative continually travelling throughout the province has helped to increase public awareness of the program, and has been instrumental in the generation of new proposals.

Thus while the occasional project has had problems in the construction phase, in general this facet of project implementation has proceeded smoothly and been well managed. It is in the later stages of monitoring and information transfer that more complications have been encountered; generally these have been resolved in an effective manner.

2.4.1 Monitoring

If information is considered the main product of a demonstration project, then the importance of reliable information production cannot be overemphasized. Discussions with project proponents about potential replicators repeatedly revealed that proven reliable performance data is essential to the development of confidence in a new technology.

In the early stages of the New Brunswick CREDA program, monitoring did not appear to receive a great deal of emphasis — it is significant that it was not included as a criterion on the "Demonstration Project Proposal Evaluation" form described in Section 2.2, and is not mentioned in many of the earlier project contracts. It was recognized that monitoring needed to be done, but it was generally left to the proponent to plan and carry out the work. This was in keeping with the orientation of the Agreement (for example, clause 4.(d) states that "the Applicant must possess the technical competence to carry out all phases of the Project") and with the limited staffing of the Secretariat.

However, as projects progressed it became increasingly obvious that a number of project proponents had neither the interest nor the competence to design and implement effective performance monitoring plans. Moreover, the data produced was not standardized between projects, even between those testing similar technologies. The problems arising in a number of the earlier projects are highlighted in the project summaries contained in Appendix B.

As deficiencies in performance monitoring began to manifest themselves, the Energy Secretariat began to focus more attention on this aspect of project implementation. In 1981, a student performance monitoring engineer was hired and subsequently a performance monitoring engineer was hired on contract. In July of the same year, at the fifth Management Committee meeting, the Province secured approval in principle "to allocate specific budgets for monitoring and information transfer within the overall Demonstration Program funding". The requirement for completion of a performance monitoring plan was added to the "Guidelines for Project Proposals".

The Energy Secretariat then made a concerted effort to encourage managers of ongoing projects which had been approved without performance monitoring plans to produce and implement such plans. In a number of cases (e.g.

Brookdale Nurseries, Wolverton Fish Hatchery), it became clear that the proponent was not competent to design and carry out the type of sophisticated monitoring the Secretariat had in mind, and a trend toward the use of consultants began. In early 1983, the original (graduate) monitoring engineer was re-hired.

Monitoring plans are now in place for most projects, and methods are being developed for the reduction and compilation of data. A number of project managers expressed the opinion that their projects were being "over-monitored", and that more information is being produced than potential replicators actually require. However, given that the majority of the projects appear to be technical demonstrations (see Section 2.3) fairly detailed monitoring is desirable. The Secretariat has developed considerable momentum in the planning and implementation of monitoring, and there is little justification for a reorientation at this stage.

The principal problem with respect to monitoring now appears to be one of time. The insufficient attention given to monitoring in the early stages of the program has resulted in delays in the completion of many projects as monitoring is belatedly carried out. In addition, the continued approval of new projects at this late date in the program means that monitoring cannot be properly completed for a number of projects by March 31, 1984. Figure 2.1 shows the status of the current portfolio of projects and indicates the estimated time required for their completion, based on estimates obtained from Secretariat staff of the time that will realistically be required to adequately carry out monitoring, reporting and information transfer. It is clear from this figure that more than 20 of the projects currently underway cannot be properly monitored by March 31, 1984. The monitoring period can probably be compressed for many of these projects, but this will obviously affect the quality of the data produced.

The question of time, deadlines, and the respective responsibilities of both parties to the Agreement is considered further in later sections. With

respect to monitoring, however, it appears that the Energy Secretariat has gradually built up a sophisticated system of monitoring planning and control which cannot yield full benefits for a large number of projects within the current time frame of the Agreement.

2.4.2 Project Reporting

Project reporting includes both interim progress reporting and the production of final reports on demonstration project results. Interim reports are a valuable method of maintaining contact between program and project managers, and of ensuring that operational problems are "flagged" early. Final reports are central to the whole process of information transfer -- throughout the study, the point was repeatedly made by program and project managers that seminars, (such as the arena retrofit seminars) and other activities held before production of a final report for a demonstration project are useful to raise the level of target audience interest, but that potential replicators wanted to see written results before making any decision.

The system of monthly progress reporting established by the Energy Secretariat appears to have been effective in keeping the Secretariat up to date on the status of on-going projects, especially when coupled with regular site visits. Reports are circulated among CREDA staff so that all staff are kept up to date on project status.

However, systems should also be put in place for dealing with final reports. CREDA has recently begun this process. As of May, 1983, fewer than half a dozen final reports had been received, and these were reviewed on a rather ad-hoc basis. The first few proponents who submitted final reports (e.g. Hot Recycling of Asphalt) received little guidance on format, with the result that these reports have had to be reworked by Secretariat staff. Subsequently, brief but adequate guidelines on report format and content were sent to all project managers, but in discussions with a number of project managers it became clear that many were still somewhat uncertain as to exactly what was required of them.

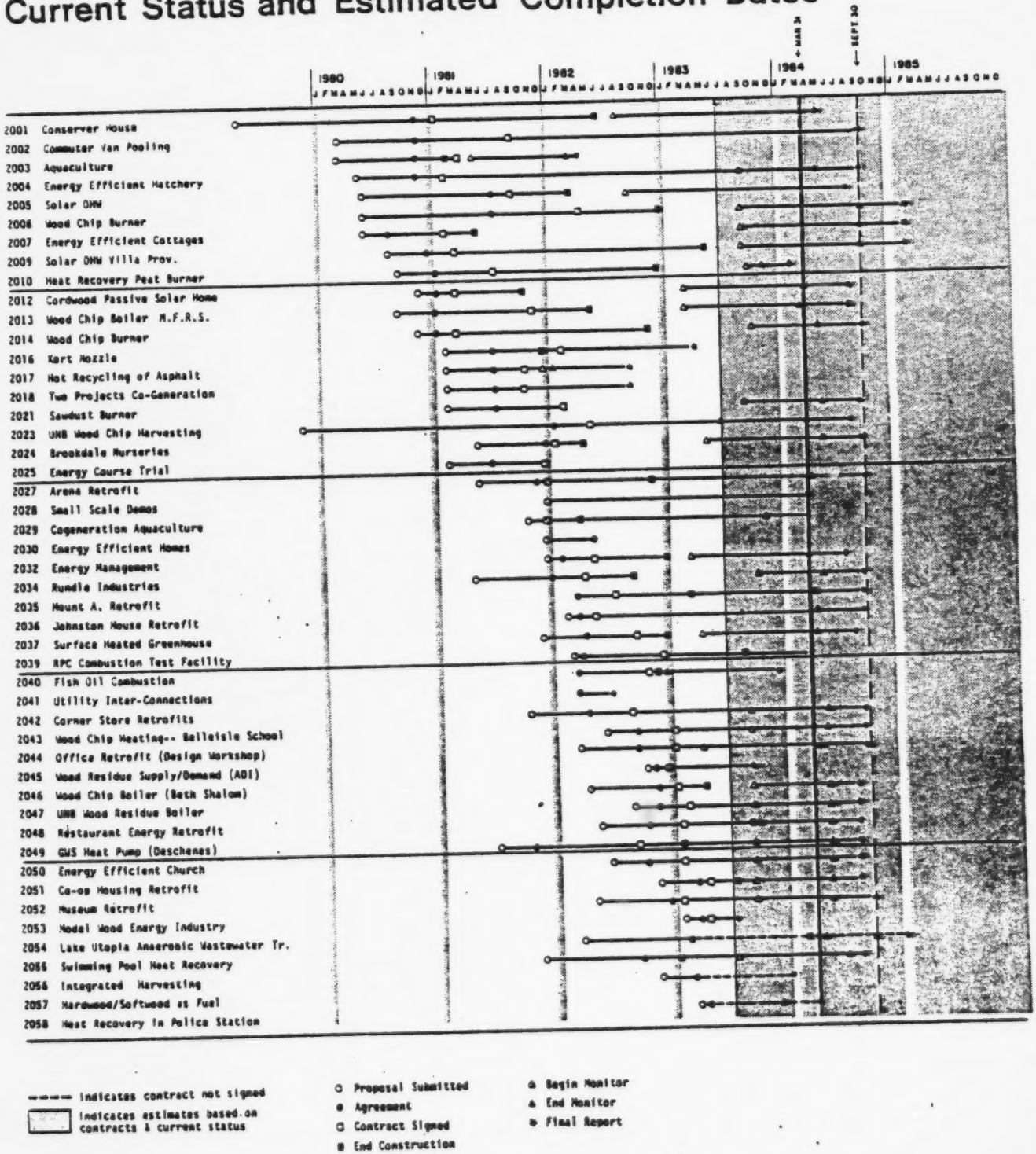
Figure 2.1 shows that the Energy Secretariat will receive a substantial number of final reports within a short time. Recognizing that it is imperative that top priority be assigned to planning and budgetting for the review, editing, rewriting, production and distribution of these reports, the Secretariat has recently undertaken these tasks. The current staff is unlikely to be able to absorb the final report workload, however, especially since a number of reports will need reworking because of the project managers' inexperience in report writing. A budget is therefore being identified to cover the hiring of freelance editors and writers, and any other report preparation functions which would not have been included in project-specific information transfer budgets.

Figure 2.1 also reveals that at least 30 final reports will not have been received by the Energy Secretariat when the Agreement ends March 31, 1984. Delays in monitoring, and recent approval of projects which clearly cannot be completed by March 31, 1984 appear to be the major reasons for this problem. Until recently, Management Committee was proceeding under the impression that under the Agreement project work could continue until September 30, 1984. This is not the case, however. Early in 1983, Management Committee was advised by EMR that the "grace period" described in Clause 5.11 applies only to the payment of "progress claims received between the 1st of April 1984 and the 30th day of September 1984 inclusive, in respect of Projects approved and completed during the course of the Agreement" (italics added). Nevertheless, several of the more recent contracts signed between the Energy Secretariat and project proponents cite the deadline for final report submission as being September 30, 1984.

Thus, if the March 31, 1984 termination date is adhered to, the majority of project final reports will not have been received. Given the importance of final, written reports in influencing decisions of potential replicators, this

Figure 2.1 New Brunswick CREDA Projects:

Current Status and Estimated Completion Dates



effectively means that the full value of investments to date in the CREDA program will not be realized. An attempt can be made to compress the project cycle in order to receive more reports before March 31, 1984 but this is likely to result in a reduction in the quality (and thus the value) of the information received.

2.4.3 Information Transfer

The production of high quality information from a demonstration project is of little benefit unless the information reaches the target audience in a manner and form appropriate to the needs of that audience. This necessitates giving considerable attention to information transfer throughout the project cycle.

There has been a good appreciation from the beginning of the New Brunswick CREDA program of the importance of information transfer. However, the fact that an information officer was not hired until nearly a year after the program started meant that front-end planning suffered. In the face of a backlog of day-to-day informational activities (production of press releases, project summary sheets, etc.), the fundamental work required to identify the potential markets for proposed technologies and to clearly define target audiences received less attention than it should under optimal circumstances.

The Secretariat's handling of the operational aspects of information transfer has, however, been exemplary. Project summary sheets (summarizing the objectives, technical description and expected benefits of the demonstration project) have been prepared in both English and French for all active projects. The province has been conscientious about submitting press releases on project approval to EMR for review and approval, even though this occasionally results in long and frustrating delays since no other information transfer activities are permitted until the press release is issued. The average turn-around time for press releases at EMR was 1.4 months in 1981 and 2.8 months in 1982. However, there were delays of 6 to 7 months in isolated cases. These delays have resulted in lost opportunities for

information transfer during the construction and early implementation stages of several projects. (For example, the CREDA sign prepared for the Geodesic Dome/Energy Efficient Church project in Moncton could not be erected throughout much of the construction phase because the press release was still waiting for EMR approval).

Despite these frustrations, a high level of information transfer has been maintained. Bilingual signs have been erected at project sites, and official openings have been organized upon request from the proponent or political representatives. Similarly, information is informally provided to the media on an ad-hoc basis, and in general the level of media coverage has been quite high. A comprehensive folio of newspaper clippings dealing with CREDA projects has also been prepared and widely distributed to political representatives; it demonstrates the considerable media attention the program has received in the province. To date, seminars have been held for three projects and have received favourable response. All information activities are summarized on a project by project basis in regular monthly "Information Transfer Updates".

The production of this wide variety of informational material is especially commendable given that New Brunswick is the only province which produces all its CREDA-related printed matter in both official languages and which provides simultaneous translation services at the seminars. This adds considerably to costs and time requirements, but is considered necessary in an officially bilingual province.

There has been considerable evolution in the program concerning the allocation of responsibilities for information transfer. In the early stages of the program, responsibility for information transfer was left largely with the proponent. However, it soon became apparent that, as with performance monitoring, many proponents lacked the necessary competence in information transfer. Problems also resulted because cost sharing between CREDA and the proponent applied equally to all phases of the project cycle. While proponents were willing to contribute toward capital costs because they could

see the direct benefits to themselves, many were reluctant to contribute toward information transfer activities of which others were the prime beneficiaries.

Problems thus arose in several cases because proponents had not been clearly made aware during contract negotiations of the extent of their responsibilities, and were subsequently unwilling and/or incapable of fulfilling their contractual obligations in information transfer.

As a result of these difficulties, contract procedures were modified, and information transfer money is now provided 100% by CREDA. While the proponent still receives the money and is nominally responsible for information transfer during the project (brochures, open houses, etc.) the Energy Secretariat is in a stronger position to direct and oversee the proponent. A weakness in the system is the absence in the contracts with proponents of any obligation on the proponent's part to obtain authorization from the Secretariat prior to the expenditure of information transfer funds. The Secretariat encourages proponents to consult with their information staff in the planning of information-related expenditures, and most proponents, being inexperienced in information transfer, are happy to do so. However, there have been a few cases (e.g. Rundle Industries) where complications have developed because proponents have printed brochures, for example, without first consulting the Secretariat. A contractual requirement for such prior consultation would reduce the likelihood of similar incidents occurring.

Proponent involvement in information transfer is considered to be desirable because proponents are likely to have more credibility with the target audience than is a government department. In addition, the proponent has access to different information transfer channels, through informal networks and through formal associations having regular meetings or conferences. However, in cases where the proponent clearly lacks competence in information transfer, the fact that he received the information transfer funds anyway can be awkward as the Secretariat attempts to direct the information

transfer from a "once-removed" position. There may also be difficulties in recovering unspent information transfer funds, as the Secretariat currently plans to do, for use in sector-wide information transfer activities. Even if a proponent has not spent all the information transfer money,* he is likely to wish to use it in some other aspect of the project. Stricter contractual control over the expenditure of project information transfer funds would appear to be warranted.

Thus, in general, the basic information transfer requirements outlined at the outset of the program (i.e. introductory brochures, guidelines, project summary sheets, press releases, QL summaries, project signs, official openings) have been conscientiously and comprehensively carried out, but planning in this area appears to have suffered, at least in part, because of limitations on staff. Much of the most important information transfer work -- the dissemination of the final project results -- remains to be done, however. Once again, a glance at Figure 2.1** reveals that this work cannot be completed (and in a number of cases cannot even begin) before March 31, 1984. The external time constraint is extremely severe in the context of information transfer.

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* This is not unlikely, since, for most projects, an information plan was not drawn up at the project preparation stage -- rather a percentage of total project costs (usually 10-15%) was allocated to information transfer. While this practice was an administratively appropriate response to staff limitations, it has meant that a number of projects have required supplementary funding for information transfer, while others have not used all their information funds.

** Time deadlines for information transfer are not shown in Figure 2.1 because project-specific information transfer plans have not yet been developed, and the level of effort required for different projects varies considerably.

3.0 PROGRAM STRUCTURE AND PROJECT PORTFOLIOS

3.1 Overview

The CREDA Agreement states in Clause 2.3 that its objectives "are to be accomplished by carrying out Projects in the areas of:

(a) renewable energy resources development and demonstration; and
(b) energy conservation development and demonstration.

Thus projects are first classified as either "renewables" or "conservation" energy projects. Within each of these classifications, the Energy Secretariat has identified subprogram groupings: the Renewables projects are divided into Wood and Others, (primarily Solar) while the Conservation component includes Retrofit, Heat Recovery and General Conservation projects. In addition, a special "Small-Scale" subprogram has been set up to administer both conservation and renewables projects where the CREDA contribution is below a $10,000 ceiling.

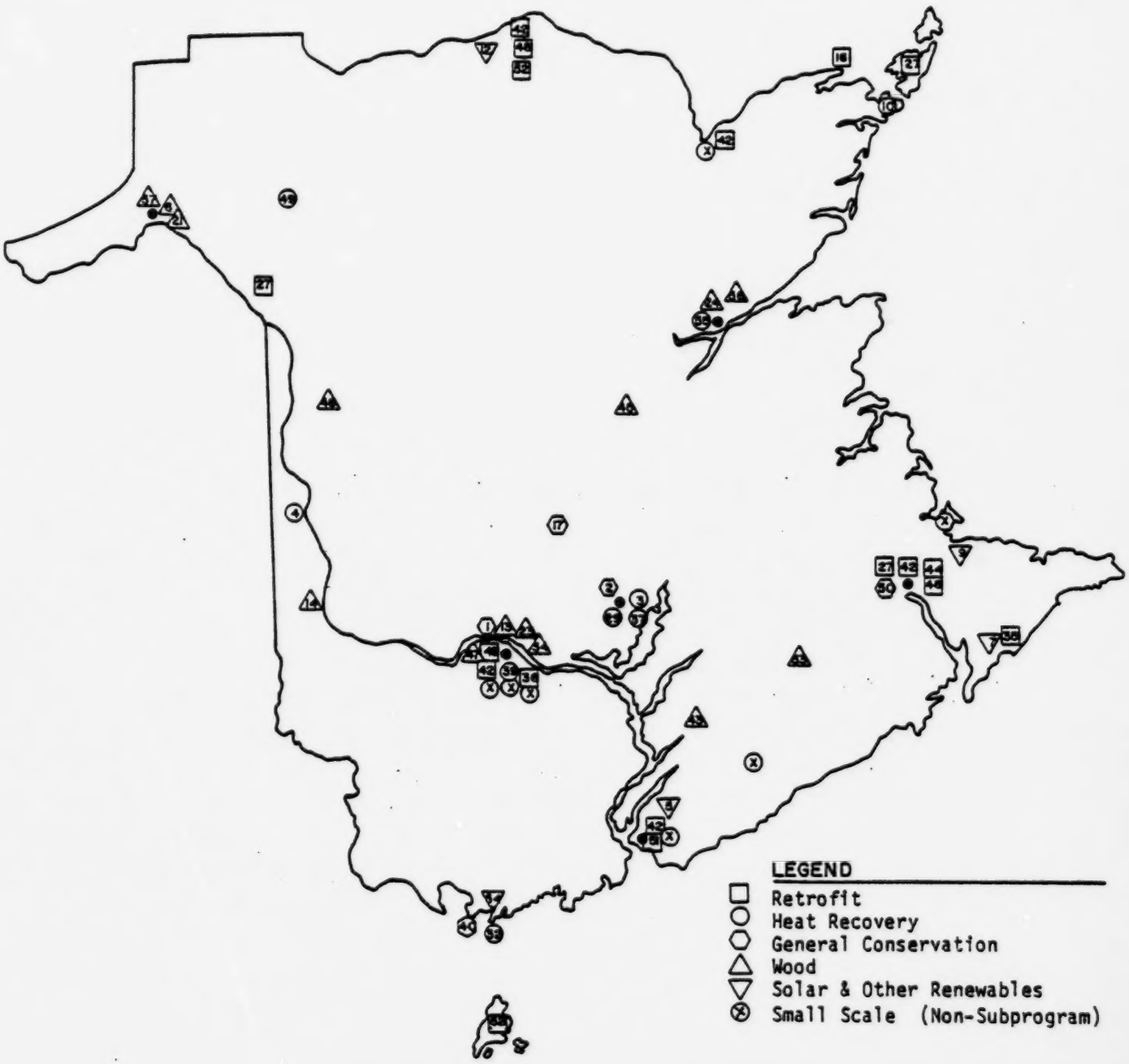
Priority subprogram areas were designated in early 1982 as wood, heat recovery and retrofit. The program is now structured around the subprogram approach, particularly with respect to information transfer. The Secretariat hopes to develop sectoral information transfer plans linking related projects and audiences — the most developed subprogram plan to date is that for wood. The emphasis on subprograms even extends to colour-coding of project summary sheets by subprogram.

Figure 3.1 shows the regional distribution of the 43 large-scale demonstrations* and 7 small-scale projects approved via the regular assessment and review process. (Projects approved under the small-scale subprogram are covered in Section 3.7).

* Certain projects are not shown in the figure because they are studies, discontinued or not site-specific.

FIGURE 3.1

Location of CREDA Projects in New Brunswick



Notes 1. Projects funded under the Small Scale Subprogram are not shown.

2. Project numbers shown correspond to the last 2 digits of project numbers (ie 2013 is shown as 13)

The status of approved projects and active proposals is summarized in Appendix C.

Figure 3.2 shows the relative distribution of project status by subprogram in graphic form. (Reference should also be made to Figure 2.1 for an alternative graphic display of project status.)

The projects in the heat recovery, wood and small scale subprograms are shown in Figure 3.2 to be generally more advanced than those in the retrofit subprogram -- the majority of retrofit projects are in the proposal assessment, project preparation or early implementation phases. This may be due to the recent emphasis on developing retrofit projects and to delays in preparation and implementation of several projects.

The current financial status of approved projects, commitments made for approved proposals and non-project funding allocations and disbursements are summarized in Appendix C. As of May 31, 1983, some $8,849,044 of the total available funds of $11,250,000 had been allocated; some $4,883,834 of this had actually been spent.

Proposals which had been approved by the Energy Secretariat and were undergoing federal review as of May 31, 1983 are also listed in Appendix C. At the funding levels proposed, these projects alone account for $2,519,730. Final approval of these funds would be significant because it would allocate all of the program budget. This points to a clear need for priority-setting.

Figure 3.3 shows the breakdown of funding allocations to date by subprogram.

It is interesting to note the trends shown in Figure 3.3 with respect to the three priority subprograms. The emphasis on heat recovery projects has been

FIGURE 3.2

Status of Projects by Project Cycle Phase

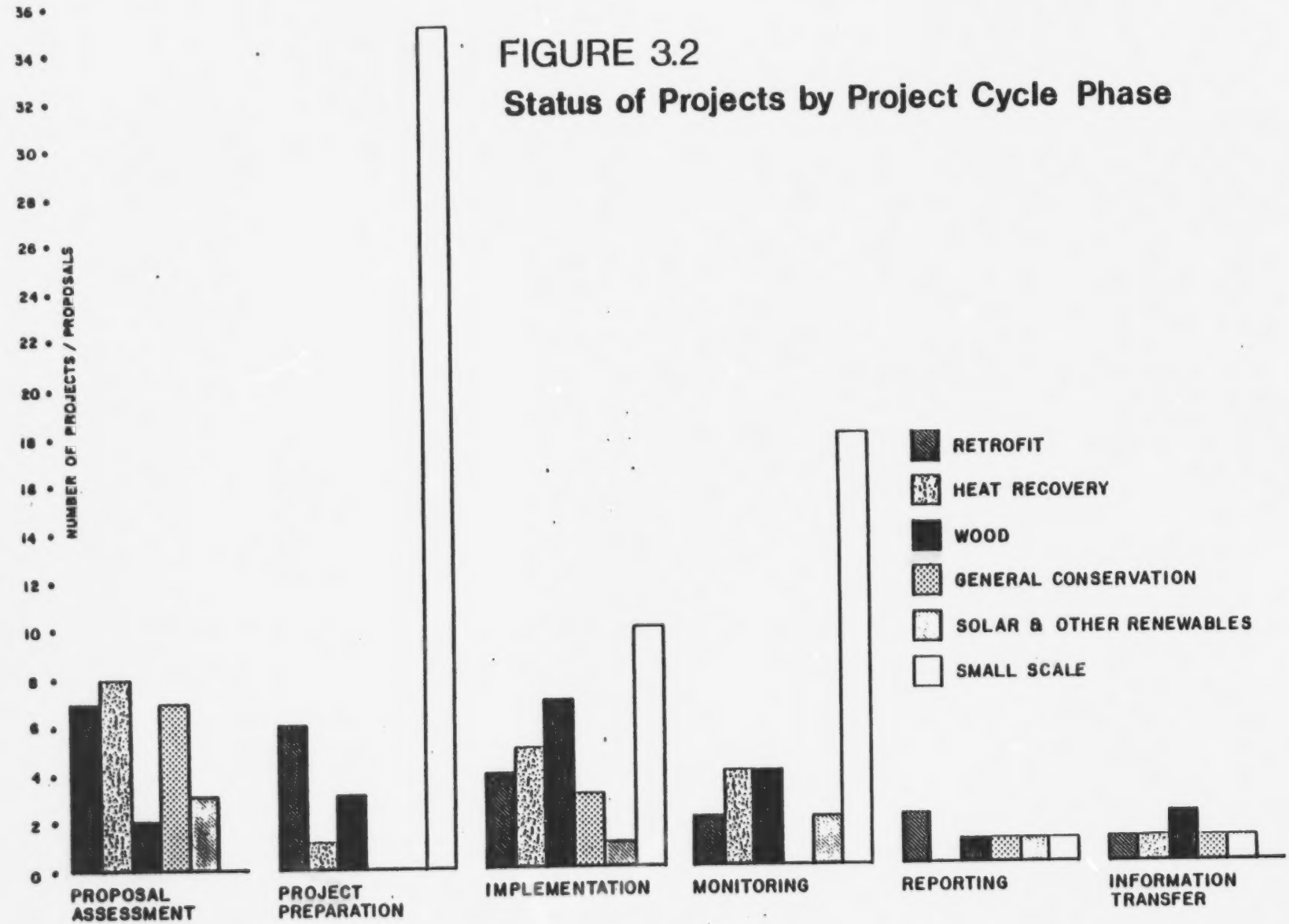
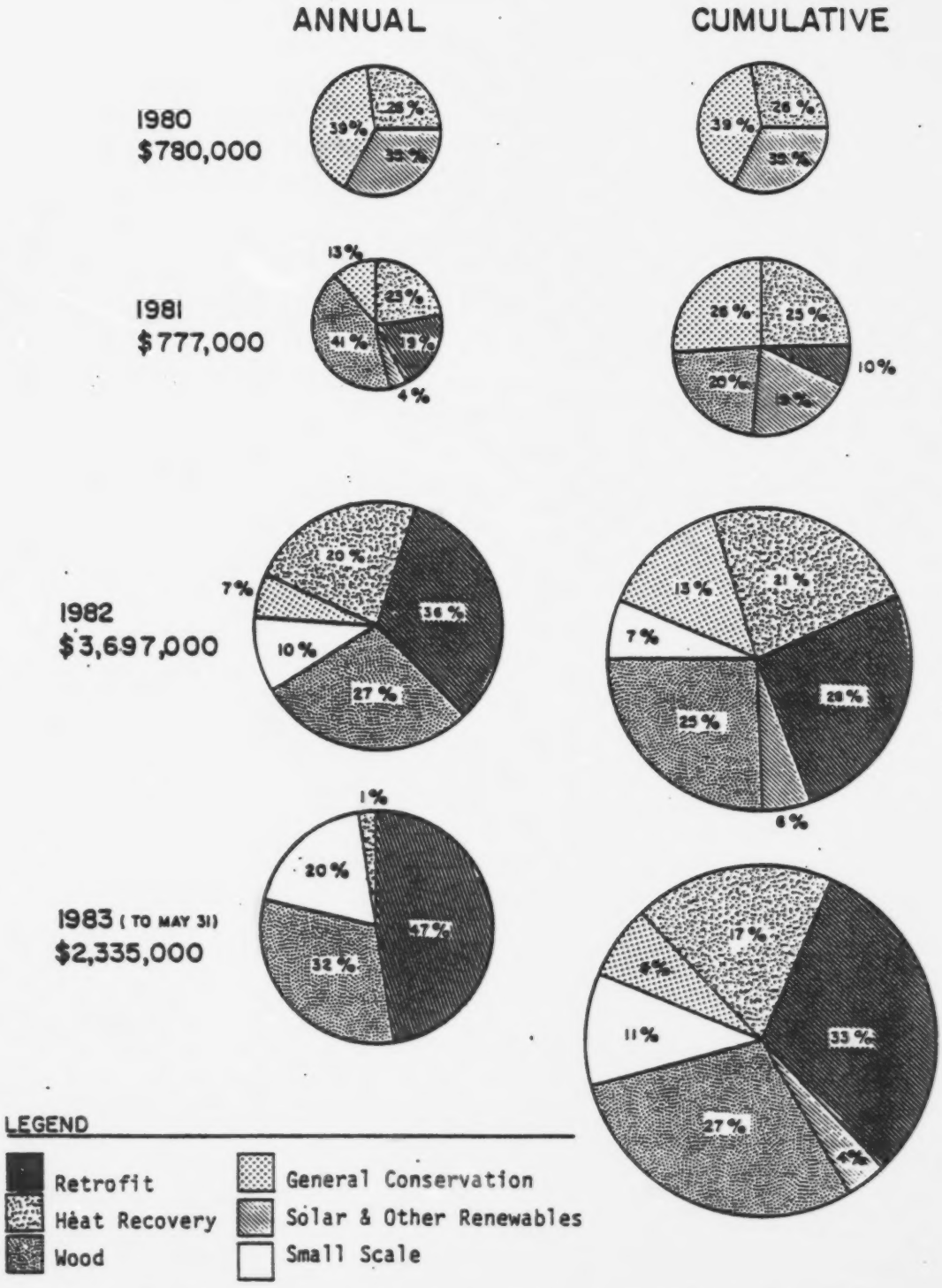


FIGURE 3.3

Annual Allocation of Project Funds by Subprogram



NOTES: 1. Funds considered to be allocated in year project approved.

2. Discrepancies between these figures and totals in Table 4.2 are due to rounding error and to slight reallocation in funding during project implementation.

fairly constant until 1983, while the proportion of funding allocated to retrofit projects has been steadily increasing to the point that retrofit projects now account for the largest proportion of approved project funds. Wood projects proliferated dramatically in 1981, and while the relative level of funding devoted to wood has declined somewhat since then, projects in this subprogram still account for the second largest portion of project funding. The priority given to solar and general conservation projects has dramatically decreased.

The implications of these trends are discussed more fully in the following sections.

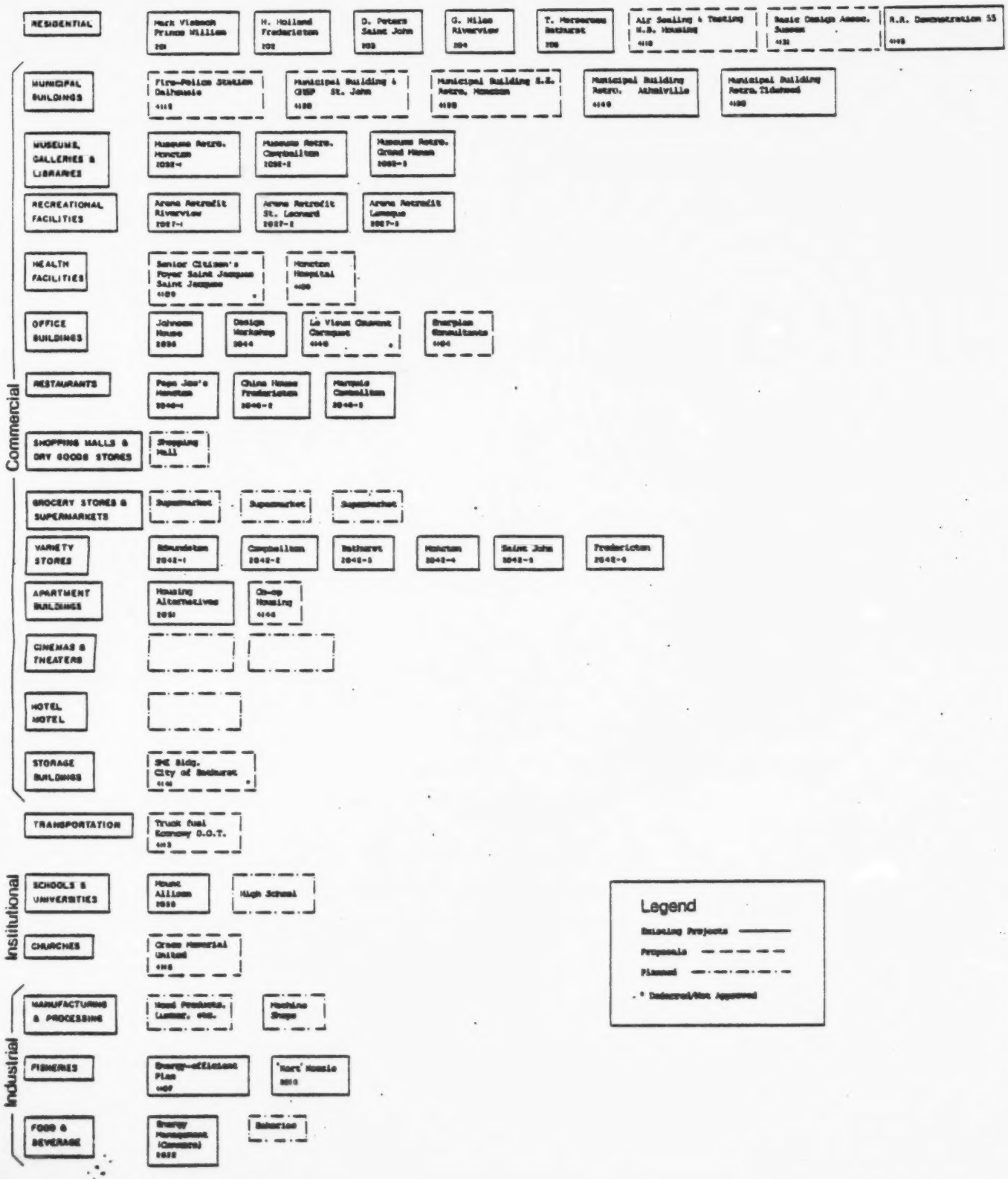
3.2 Retrofit

Information on the retrofit subprogram was obtained from discussions with CREDA staff and study of specific projects (see Appendix C). Of the three "priority" subprograms, retrofit is the least well defined. No plan has yet been elucidated — the basic working document is the outline shown in Figure 3.4. This lists ongoing, proposed and planned projects by sector.

To date, eleven projects with total funding of some $1,642,915 have been approved in the retrofit sector (excluding small-scale projects). Another $1,040,500 has been committed for six projects which have been approved but for which contracts have not yet been signed with the proponents. One proposal with proposed funding of $29,530 is under review at EMR while five proposals with a total recommended CREDA funding level of $465,000 are under review by the Energy Secretariat.

The largest approved retrofit project is the Mount Allison University project. CREDA is contributing $800,000 to this project, in which some 35 university buildings are being retrofitted. The project, which is in the advanced implementation/monitoring phase, appears to have been well planned and managed. It will lend itself well to national information transfer.

Figure 3.4 New Brunswick-CREDA Retrofit Plan



A principle concern with respect to the retrofit subprogram is that of criteria for project selection. Because the retrofit subprogram plan has not been defined in written form, its objectives are unclear. Judging by the variety of projects being pursued, the prevailing aim appears to be to "cover all bases" rather than to select and concentrate on those sectors in which retrofits have the greatest potential to achieve cost-effective energy savings. General markets were identified in the 1982 planning document, but further work should be done to rank potential markets and specify priority areas if any continuation of CREDA is contemplated.

The lack of a written plan and clear economic objectives have had a negative impact particularly in the convenience store and restaurants retrofit projects. In both cases the consultant proponents have had great difficulty in finding establishment owners willing to participate, even though CREDA will pay 66% of the retrofit costs. Even at this high level of subsidy, financial and other barriers are sufficient to prevent acceptance of the proven technologies involved.

These projects contrast with the Ducted Propulsion System ("Kort Nozzle") project, which was well under way before the retrofit plan was conceived. This project, involving the retrofit of the propulsion system of a wooden shrimp boat operating in the Gulf of Saint Lawrence, was generated by the proponent and directed at a specific target audience of whose needs the proponent had a good appreciation. The project has been a technical success, cutting fuel consumption by 20%, and has generated considerable interest among the target audience — for a minimal CREDA investment of $11,500. While financial barriers to replication exist, the active involvement of a potential funding agency (Fisheries and Oceans) throughout the project augers well for potential replication.

Another of the earlier retrofit projects — the arena retrofit project — illustrates the benefits of identifying and involving the target market. The early involvement of the Department of Youth, Recreation and Cultural Services provided a valuable conduit to the target audience. This project has been one of the most successful of the New Brunswick CREDA projects — it was well managed and considerable attention was devoted to information transfer tailored to the needs of different target audiences (i.e. a technical report for engineers and a less technical booklet for arena managers and city councillors; seminars addressing in detail the practical considerations involved). An attempt to identify barriers to replication has also been built in through provisions for seminar questionnaire followup.

The differences between these projects emphasize the importance of establishing the need for a demonstration before embarking on a project. In this sector, where many potential replicators (e.g. homeowners, small businesses) cannot be easily accessed through a conduit such as an association or a provincial department, more emphasis should be given to formal market studies. These have the disadvantage of being expensive and time-consuming, but even superficial market studies can help to establish the real needs and problems of target audiences, and thus indicate what the objectives of demonstrations should be.

The current lack of written defined criteria for retrofit project selection is problematic given the dramatic increase in the priority being accorded to projects in this subprogram (see Figure 3.3). The retrofit plan is the least well defined of the three priority subprogram plans, and yet more money has been allocated to this sector than to any other.

It is thus recommended that, if more projects are contemplated, the Energy Secretariat clarify its plans in the retrofit sector and place greater emphasis on identifying those sectors in which retrofits have the greatest viability. As a first step, a detailed retrofit plan which includes provision for some sort of market studies should be developed and approved by Management Committee prior tc approval of any more retrofit projects.

3.3 Heat Recovery

A plan of action for the heat recovery subprogram has been developed, but has not yet been approved by Management Committee. It calls for a total CREDA allocation of $3,760,000 in this sector of which approximately $896,000 had been allocated at the time the plan was written (January, 1983).

There are now ten approved projects in the heat recovery sector, for which CREDA funding amounts to $1,108,010 (excluding small-scale projects)*. Four proposals with a total recommended CREDA contribution of $494,000 are currently under review by EMR and five proposals with total recommended CREDA funding of $115,300 are under review by the Energy Secretariat.

Figure 3.3 indicated that the funding priority given to heat recovery projects has remained fairly constant throughout the term of CREDA. Unlike retrofit, most of the heat recovery projects funded to date have been initiated originally by private sector (non-consultant) proponents.

A variety of heat recovery projects have been undertaken. Some demonstrate well proven technology such as heat pumps, while others focus on the development and demonstration of novel concepts such as surface-heated greenhouses. Many of the projects have been low profile; exceptions are the various projects being carried out at the New Brunswick Power thermal generating plant on Grand Lake. The high profile of these projects may be due to the nature of the proponent. The utility considers the promotion of waste heat to be in its best interest, since co-ventures with waste heat users can be profitable. Also, utilities do not compete with each other in the same manner as do other businesses, so fear of competition does

* A total of eleven heat pumps demonstrations have been approved as small scale projects. Few heat pump projects have been funded under the Heat Recovery subprogram, although proposals have been received in most cases; paybacks on these well proven technologies have been short enough to enable proponents to proceed without CREDA funding.

not constrain promotion of the projects. The fact that a number of different agencies are involved particularly in the aquaculture projects, has provided channels to a range of target markets.

The high profile accorded these projects in comparison with other heat recovery projects suggests that Energy Secretariat involvement in information transfer should be greater for projects with private sector proponents who have little to gain from publicizing their results. To date, however, an information transfer plan for this subprogram has not been developed, and the draft Heat Recovery Plan does not address information transfer in any great detail. It is strongly recommended that a detailed information plan be incorporated into this document before it receives Management Committee approval.

In this way it should be possible to rectify one of the weaknesses of the draft plan, i.e. its preoccupation with technical, rather than market, criteria for project selection. The focus of the document appears to be on the need to demonstrate a complete range of heat recovery technologies. The question of whether this is necessary to meet the needs of potential users is not explicitly considered. The plan requires a market assessment along with the in-depth technical plan.

Thus, as in the retrofit subprogram, there is a clear need for more emphasis on identifying the real needs of the potential market and on orienting information transfer plans accordingly. However, it is equally clear that there is not sufficient time left in the Agreement to develop and implement comprehensive, market-oriented plans in either of these sectors. Only if the Agreement is extended is some fashion can appropriate plans be developed, approved and implemented.

3.4 General Conservation

Energy conservation projects which are not retrofit or heat recovery projects are grouped in the "General Conservation" subprogram. However, this "subprogram" is primarily an administrative convenience. It has no plan and is not considered by the Energy Secretariat to be a priority area. The decline in emphasis in general conservation projects was shown in Figure 3.3.

Nevertheless a number of projects termed "general conservation" projects have been carried out under the Agreement — a total of 7 approved projects with total funding of $637,104. (One of these projects, approved funding for which totalled $40,435, has been inactive for some time). A number of proposals for a variety of general conservation projects are currently under review — five (total proposed funding $1,280,000) by the Energy Secretariat and one (recommended funding $101,200) by EMR.

Fewer general conclusions can be drawn about the projects in this subprogram, as compared with retrofit or heat recovery projects because of the wide variety of projects involved. Nevertheless, a number of observations can be made about the CREDA project cycle as a result of examining the various general conservation projects.

The largest of these projects — Conserver House — was the first CREDA project to be signed. It is not surprising therefore (see Appendix B) that it has incurred delays and adjustments. In the early days of CREDA, the Energy Secretariat had little staff and less structure. Delays were encountered in contract signing (because a contract format had to be devised), in payment (because there was no accountant for CREDA, and no standardized system of administration) and in basic information transfer such as press releases (because CREDA did not yet have an information officer when the project was approved).

The Conserver House project is one of the most high profile projects under the New Brunswick CREDA program. It is also the most intensively information-oriented project, and has a strong market orientation. The actual retrofit of the Fredericton house was not the main objective of the demonstration, which is why the project is not classified under the retrofit subprogram. Rather, the main objective was to establish a public information centre for conservation and renewable energy.

The project has been successful in generating public interest (i.e. raising public awareness) in the Fredericton area, but has been less successful in developing outreach efforts to other communities. It is likely that the impact of this project would have been greater if a more comprehensive information transfer plan incorporating a more aggressive outreach marketing strategy had been developed. Budgetary constraints were partly responsible for the limited outreach program.

Another early conservation project was the commuter vanpooling project, which offers subsidies to prospective vanpool operators. When this project is compared with later projects, the evolution which has taken place in project selection and preparation procedures can be seen.

Proposal assessment for this project appears to have been influenced by the fact that CREDA was receiving few transportation-related proposals despite a strong desire to carry out demonstrations in the transportation sector because of the considerable proportion of energy (especially oil) consumed by this sector. Both provincial and federal reviews of the proposal expressed reservations about the basic structure and management of the proposed project; however, Management Committee approved the project, stressing in its written approval the need for a high profile and a well developed information transfer plan. This, after all, was to be a marketing demonstration -- the concept of vanpooling is well proven, and a number of independent vanpools were already operating in New Brunswick.

However, the project proponent chose not to adopt many of the suggestions of the Secretariat's information officer. As a result, project promotional material tended to be unattractive and confusing; the welter of legal obligations it described (insurance, declaration of income, etc.) appears to have discouraged prospective vanpoolers. The project has had only limited success — only three vanpools have been funded rather than the fifteen or twenty originally envisioned.

The vanpooling project provides a good example of the problems encountered in the early days of the CREDA program when more of the onus for information transfer was left with the proponent. Another early "general conservation" project — Hot Recycling of Asphalt — also had some problems with information transfer because of proponent inexperience, although the project ultimately proved to be successful.

The proponent was a paving company which competently installed and operated equipment to recycle reclaimed asphalt paving and transferred information through tours and discussions with other paving contractors. The project was well managed and has already generated several replications. The only difficulties encountered were at the stage of final report writing where the quality of the report reflected the inexperience of the proponent. This was one of the first projects to reach this stage, and the Energy Secretariat left the onus largely with the proponent. As a result of the difficulties encountered in the production of this report the Secretariat ultimately developed more standardized guidelines for report preparation.

These earlier projects appear to have had more difficulties with informational aspects because the CREDA office was understaffed relative to the information demands being generated by the program. Also, in earlier projects, CREDA's contribution to information transfer was proportional to its overall contribution to total project costs. Thus if CREDA contributed 75% of total project costs, the proponent was responsible for 25% of each project cost, including information transfer. Since proponents did not always

perceive information transfer activities as being as beneficial to themselves as construction activities, some were reluctant to contribute financially to information transfer. Also, some proponents may have felt justified in ignoring CREDA staff advice on information transfer because CREDA was not paying the full costs. The hiring of more information staff and the increase of CREDA contributions to 100% of project information costs have eliminated the problems associated with earlier projects.

3.5 Wood

The wood subprogram is the third priority subprogram of the New Brunswick CREDA program. To date a total of twelve projects have been approved, with funds allocated amounting to $1,362,308. Two other projects have been approved but contracts have not yet been signed with the proponents — the CREDA funding involved is $294,000. Two proposals are currently under review, one by EMR and one by the Energy Secretariat — the proposed CREDA contribution would be $500,000.

The wood subprogram is better defined than the other priority subprograms; its plan has been approved by Management Committee. It is also the only subprogram in which a concerted effort has been made to identify and address barriers to diffusion beyond the kinds of information barriers typically addressed by demonstrations. For example, the barriers of timing and commercial viability, and lack of supply infrastructure (both common barriers mentioned in Section 1.4) are addressed by several projects within the wood energy subprogram.

The current wood energy subprogram plan states that its "thrust is to enhance both the economic and technical management of the forest by the rationalization of the wood energy industry. In one sense it means another primary product, composed of stick wood and wood residues, is to be a

standard component of wood harvesting and will be a source of employment as well as an aid to resource management." Thus the wood subprogram differs from the other subprograms in that it is not concerned solely with energy. The economic, employment, and silvicultural benefits to the forest industry are integral components of the wood energy strategy.

Another strong point of the subprogram is that it focusses quite clearly on a select range of technologies, namely those related to the production and consumption of wood chips. The decision to concentrate on chips was based on a review carried out by the Energy Secretariat prior to the inception of CREDA, which indicated that chipping appeared to be the simplest, most economically viable method of producing a standardized wood fuel. Thus a conscious and considered decision was made to focus on the most commercially attractive form of wood fuel, although technological diversity is maintained by several projects involving sawdust and bark and possible future projects using densified fuel.

The subprogram plan focusses on four elements -- supply, use, manufacturing spin-off and information transfer. Supply includes availability, harvesting, storage and transportation of wood fuel. A major impetus for the development of the subprogram and plan appears to have been the fact that while CREDA was funding a substantial number of projects (e.g. Madawaska Wood Chip Burner, Maritime Forest Ranger School Wood Chip Boiler, CAMR Wood Chip Boiler, Brookdale Nurseries, Wood Chip Harvesting and Distribution) in which equipment for wood chip combustion was being developed and demonstrated, there was no supply infrastructure for wood chips and little information on the costs and benefits involved in creating one. This lack of infrastructure was identified as a major barrier to the diffusion of wood chip combustion technology.

Most of the supply-oriented projects have only recently been approved, and thus few results are available. Several (e.g. the ADI, and Neill and Gunter projects) were generated by the Secretariat and are studies rather than

demonstrations. Together, the various supply projects address the current information gaps with respect to the economics of establishing a wood chip supply infrastructure.

A great deal of work has already been done on the combustion of wood chips -- eight projects have been funded to develop and demonstrate wood chip combustion equipment. All have been technically successful, and two show promise of manufacturing spinoffs. Through CREDA, Rundle Industries has developed an automatic wood chip stoker which it hopes to commercialize, and the Arvin chipper developed for the UNB harvesting project could potentially be manufactured in New Brunswick for less than the cost of imported Scandinavian chippers.

The wood subprogram is also the only subprogram with an information transfer plan (although the Secretariat hopes to develop similar plans for retrofit and heat recovery if time permits). The plan identifies and budgets for a variety of activities (including tours, brochures, seminars, articles for professional and technical magazines, and displays) designed to transfer the information obtained from related projects within the subprogram. A major attribute of the plan is its attempt to coordinate the results of the various projects.

The wood subprogram is the best planned and managed of all the subprograms. The hiring of an experienced professional forester to manage the subprogram has provided project proponents with a source of technical advice and ensured that the program complements New Brunswick forestry policy.

A final point to note with respect to the wood subprogram concerns time. A factor that distinguishes the wood subprogram from the other priority subprograms is the manner in which the projects are interrelated. Supply and harvesting projects are necessary preconditions to replication of combustion projects; an arena retrofit is not a necessary precondition to retrofitting of a

restaurant. The heat recovery and retrofit projects can stand on their own in a way that the wood projects cannot. Thus unlike the other two subprograms, the Wood Subprogram appears to require the completion of all its projects to maintain the integrity of the subprogram. The consequences of the program ending March 31, 1984 will therefore be more severe for the wood subprogram.

3.6 Other Renewables

Like the "General Conservation" subprogram, the "Other Renewables" subprogram is more of an administrative grouping than a true subprogram. Excluding small-scale projects, the subprogram comprises four approved solar projects (total funding $292,164) and one project dealing with utility interconnect policy as it relates to wind and other parallel electrical generation ($15,000). Two projects have been approved by Management Committee but contracts have not yet been signed by the proponents: one involves anaerobic digestion of pulp mill effluents (CREDA contribution of $400,000) while the other involves combustion of fuel peat* (CREDA contribution of $1,340,000). Currently a biogas proposal for $105,000 is under review by EMR, and a proposal for a peat usage study (recommended funding $10,000) is being reviewed by the Secretariat.

Figure 3.3 illustrates how the priority accorded to solar projects has decreased since the first year of CREDA. The early desire to demonstrate a wide range of technologies has been tempered by the poor economics of active solar systems in the New Brunswick environment. The solar system in the United Church Energy Efficient Senior Citizens' Cottages project, for example, has a simple payback of more than 14 years.

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* Peat is not strictly speaking renewable, but has been included in this subprogram for convenience.

Prior to CREDA, there had been little experience with major solar projects in New Brunswick, so that there was indeed a need to verify the operation and economics of large solar systems. For example, information on which Secretariat staff were relying indicated that the payback on the United Church system would be only about half what it ultimately turned out to be.

Once the poor economics became obvious, solar projects were no longer funded. However, for several years the province has been attempting to develop projects in the area of peat -- particularly the demonstration at Jiffy Products of a Lamb Cargate wet cell burner modified to burn fuel peat. Management Committee had questions about the technology involved, and thus approved the project (to $1.3 million) on the condition that Jiffy and Lamb Cargate do the necessary R&D work to bring the technology to a demonstratable stage.

The Secretariat's other area of interest in this subprogram is biogas. No projects have yet been carried out although $400,000 has been approved for the demonstration of a New Brunswick - designed bulk volume fermentor at the Lake Utopia paper mill. The project has been delayed while the proponent seeks additional government assistance for the modernization of the mill and its operations.

Generally, renewable energy sources other than wood are no longer a priority for CREDA. This appears to be an appropriate response to the poor economics of active solar systems in the New Brunswick climate and of wind and hydro in a province with comparatively low electricity rates and relatively few remote locations.

3.7 Small Scale

The small scale subprogram was developed to deal efficiently with small project requests. Eight small projects totalling $52,137 were funded after being submitted to the regular approval process before the official small scale subprogram was developed.

The subprogram is treated for administrative purposes as one project, and is divided into two phases. The program is administered by the Research and Productivity Council (RPC), thereby considerably reducing the administrative burden on the Energy Secretariat. Proposals have been solicited through two public invitations for proposals. Initial screening of proposals is carried out by RPC; the "short list" must then be approved first by the Energy Secretariat and then by Management Committee.

The system of proposal assessment under the small scale subprogram is intended to be less rigorous than that applied to larger projects — it is intended "to meet the needs of the individuals who have difficulty with the demonstration approval mechanism designed for large projects"*. The basic criteria which must be satisfied by a proposal are:

1) the proposed project must demonstrate conservation and/or renewable energy technologies;

2) the proposal must contain some form of energy systems performance monitoring and information transfer;

3) the proposal must be technically sound;

4) the proposal must show economic viability;

5) the application must contain a minimum of 20% financial contribution on the part of the applicant. The higher the contribution the more likely that the proposal will be approved;

* Memo of Dan Clarke to John Williamson, April 16, 1981.

6) potential for commercialization of conservation and/or renewable energy equipment is taken into consideration;

7) geographical location and technological mix are also taken into account when approving grants.

A point system is used to assess proposals, e.g.

Technical Content	3	points
Performance Monitoring	7	points
Information Transfer	8	points
Economic Analyses	2	points
TOTAL	20	points

It is suggested that greater priority be given to economic consideration in the assessment, because of the importance of such considerations to potential replicators.

The first request for small scale proposals was issued via newspaper advertisements in November of 1981. Approximately 200 proposals were received of which 27 were ultimately funded and implemented. The maximum CREDA contribution per project was $8,000. Total funding for Phase I of the small scale subprogram is $350,000, of which $215,087 has been committed to projects. The remaining funds are devoted to administration (including the salary of a full-time program manager).

The breakdown of the projects by technology is shown in Table 3.1. There appears to be an even split between conservation and renewable energy projects, and a wide variety of technologies is being demonstrated. The high number of solar projects is notable given the low priority accorded to solar in the general CREDA program; this reflects the fact that the economics of small scale systems built by "do-it-yourselfers" are generally better than those of large installations.

The locations of the Phase I small scale projects are shown in Figure 3.5.

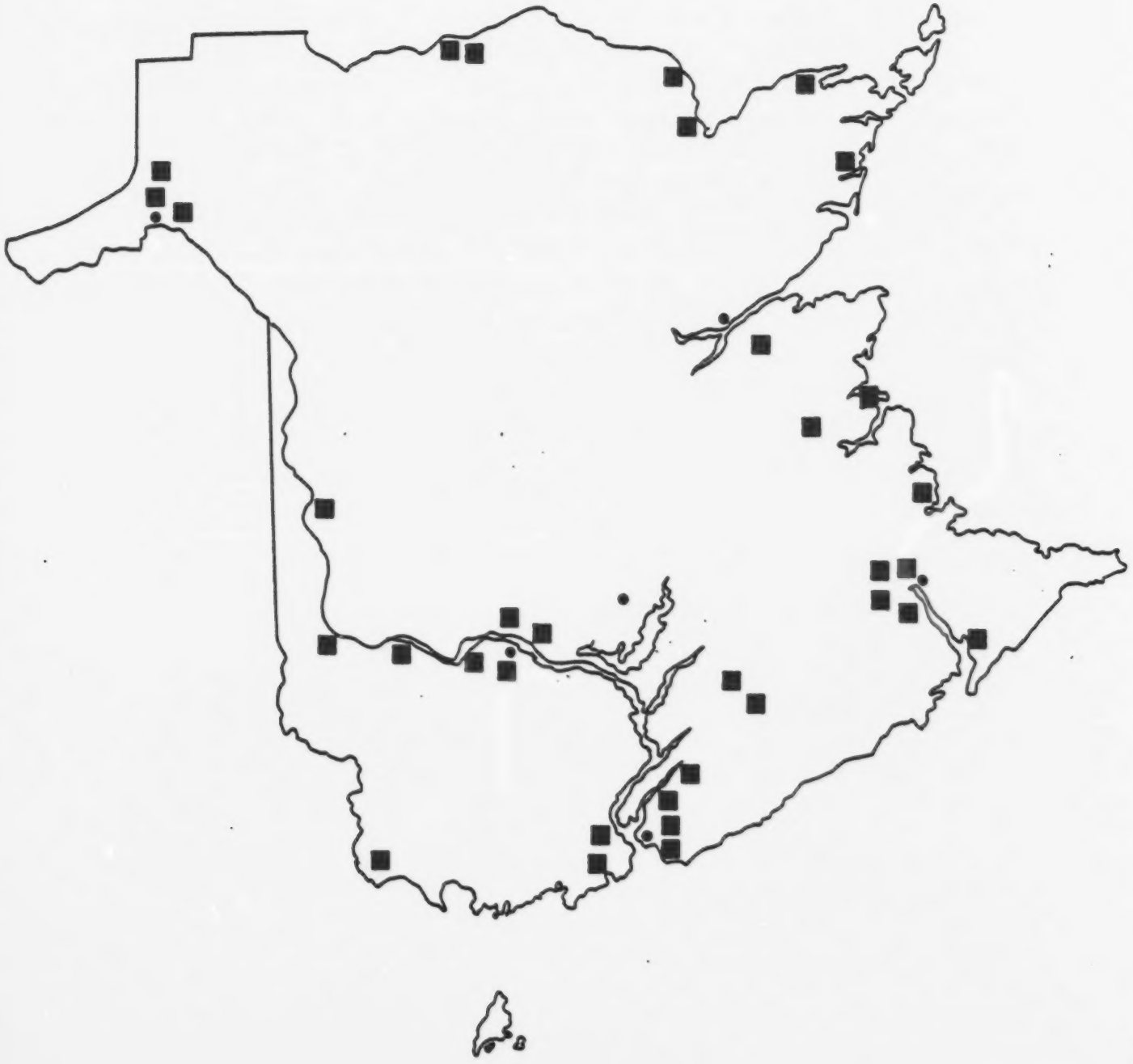
TABLE 3.1

Technologies Demonstrated in Phase I of
Small Scale Subprogram

Technology/Sector		Number of Projects
1.	Conservation	
	Retrofit	5
	General Conservation	4
	Heat Recovery	3
	TOTAL	12
2.	Renewables	
	Solar	7
	Wind	4
	Wood	3
	Micro Hydro	1
	TOTAL	15

FIGURE 3.5

Location of Small Scale Projects: Phase I



Most of these projects are now in the late implementation or monitoring phase and should be completed by fall of 1983. Invitations for proposals for the second phase of the small scale subprogram were made in newspaper and radio advertisements in December of 1982. Some 200 proposals were received, of which 36 were approved for funding. The funding limit was $10,000 per project; some $254,655 of a total Phase 2 funding of $477,832 has been allocated to these projects. The breakdown of projects by technology sector is shown in Table 3.2. The locations of the projects are shown in Figure 3.6.

TABLE 3.2
Technologies to be Demonstrated in
Phase II of Small Scale Subprogram

Technology/Sector	Number of Projects
1. Conservation	
General	10
Heat Recovery/Heat Pumps	8
Retrofit	3
TOTAL	21
2. Renewables	
Solar	11
Wind	2
Wood	2
TOTAL	15

Information transfer for small scale projects consists basically of project summary sheets, signage, two open houses per project, and a final report.

FIGURE 3.6

Location of Small Scale Projects: Phase II

The preparation of summary sheets has been considerably delayed with the result that a number of proponents have had no information to hand out at open houses. However, this problem has been resolved and it should be noted that New Brunswick is the only CREDA province which has provided summary sheets for small scale projects. There have also been complaints that signs have not been provided for open houses and in general, the administration of the small scale projects appears to have been less structured than for the larger projects. However, this is understandable given the high level of effort required to administer small projects relative to the dollar value involved. Administration is also complicated by the fact that most small scale project proponents are ordinary individuals who have little experience with government programs, contracts, report writing, etc.

The main objectives of the small scale subprogram are to increase general public awareness and adoption of conservation and renewable energy technologies. Discussions with various small scale project proponents indicated that most of the projects have been successful in increasing awareness (i.e. open houses have generally been well attended) but it is difficult to determine what impact the subprogram has had on adoption of energy technologies.

3.8 Summary and Quantification of Objectives Achievement

The preceding sections have indicated the present status and organization of the CREDA program in New Brunswick and illustrated the experience that has developed as a result of projects undertaken to date. Generally, a review of the project portfolio indicates that the manner in which all phases of the project cycle are handled has improved considerably since the early days of the program.

A subjective assessment of the degree to which the New Brunswick CREDA program has met the preconditions for successful demonstrations and employed appropriate strategies follows. In order to provide a structured basis for this assessment the eight conditions for successful demonstrations developed by Rand, and presented in Section 1, were used.

3.8.1 Preconditions and Strategies for Successful Demonstrations: The CREDA Record

Precondition #1: Major technological problems have been resolved beforehand.

This precondition appears to have been met in the majority of New Brunswick CREDA projects. Only in a few projects (Rundle Industries, Jiffy Products) was considerably more technical development work required than was anticipated, but this did not prove to be a detriment to the projects.

Precondition #2: Program costs and risks shared with local participants.

To a certain extent this precondition has been met, in that in virtually all projects third parties have been requested to contribute at least 20% of project costs. However, the data provided in Table C-1 (Appendix C) indicate that in two-thirds of the large-scale projects funded to date, the CREDA contribution was in excess of 50% of total project costs. A review of the projects (see Appendix C) indicates that most of the technologies demonstrated can be considered to be proven, and it is unlikely that the technical risks involved in many of the heavily subsidized projects were sufficient to justify the high level of CREDA contribution. However, the poor economic climate which has prevailed in New Brunswick throughout the lifespan of CREDA has undoubtedly contributed to increased caution and risk-adversiveness on the part of potential proponents; as a result, many proponents have demanded substantial CREDA contributions as a condition for their participation in projects. In a number of cases, the rationale for high CREDA contributions appears to have been the poor financial circumstances of the proponents rather than the level of project risk per se.

Thus this second precondition for success appears to have been only partially met. Under the circumstances, however, it would have been very difficult to meet this precondition completely.

Precondition #3: **The initial concept or project idea originated at the local level.**

A review of approved projects indicated that some 43% were initiated by private sector proponents (excluding consultants), 21% by provincial government departments and agencies (other than the Energy Secretariat), 16% by consulting firms, 12% by the Energy Secretariat and 8% by universities and colleges.

Thus in most cases, project ideas have been generated by third party proponents. (This is considered to be a precondition for success because it indicates a certain measure of market pull). This precondition has apparently therefore been satisfied except in the retrofit subprogram, where the majority of projects have been generated by the Secretariat or by consultants.

Precondition #4: **Existing market for products or processes similar to the innovation.**

Most of the CREDA projects in New Brunswick have demonstrated technologies designed to replace or conserve energy being used in existing processes and activities. Markets do exist for products and processes similar to many of the heat recovery, retrofit and wood heat technologies in particular. A few technologies (e.g. geodesic domes) are extremely innovative and their market potential may be limited, but on the whole this precondition appears to have been met.

Precondition #5: **All elements for commercialization (manufacturers, purchasers, regulators, etc.) participated in the planning and implementation of the project.**

This precondition has not been met for the majority of projects in the New Brunswick CREDA program. Projects such as the Waste Heat Aquaculture

and Arena Retrofit projects are exceptions. However, as discussed earlier, the fact that unsolicited proposals must be kept confidential means that early involvement of all elements may be difficult if not impossible, at least during the planning stages.

Precondition #6: Only limited or no external time constraints.

This precondition was met in the earlier projects in that the time allotted should have been adequate to complete the project cycles. (That it has not proved adequate in some cases is due largely to long delays in setting up monitoring regimes). However, later projects are clearly being subjected to unrealistic schedules which are reflections of the severe time constraint under which the Program as a whole must operate.

Thus the fact that this precondition has largely not been met is due more to the time constraints built into the overall Agreement than to factors under the control of CREDA staff. However, Management Committee has recently approved several projects (e.g. Lake Utopia Anaerobic Wastewater Treatment) which clearly cannot be properly completed within the time frame of the Agreement. In the sense that time constraints do not appear to have been given appropriate weight during project selection and approval, this precondition does not appear to have been met. However, a more important concern is the time contraints imposed by the short time frame of the original Agreement.

Precondition #7: Technology can be easily reproduced from site to site.

This precondition has been satisfied. A certain amount of site specificity is, however, inherent in most applications of conservation and renewable energy technology. This frequently necessitates the use of consultants to tailor systems to users. If the consultant expertise is readily available, the barriers to reproduction from site to site should not be great. By contributing to the development of New Brunswick consultant expertise in conservation and renewable energy, CREDA has thus helped to satisfy the basic precondition.

Precondition #3: Only limited cooperation required among different elements within the institutional environment.

If this precondition is met, then institutional barriers will be minimized. However, it should be noted that if the precondition is not met, demonstrations can still succeed; in fact, the involvement of several institutional elements may be valuable in indicating potential institutional barriers to replication of a demonstration.

In several CREDA projects, considerable inter-institutional cooperation has been required, especially when the proponent has been another government department. Few problems have been encountered, however, and this precondition has generally been met.

The New Brunswick CREDA program has thus met nearly all of the preconditions for demonstration success. In order to subjectively assess the strategies used by the Secretariat, the analysis framework developed by Rand was again used.

Strategy #1: Include explicit plans for followthrough after the demonstration, and build an in-house staff with marketing as well as technical experience.

Some attempt appears to have been made in the past year to pursue this strategy, in that the number of information staff has been increased and initial steps have been taken toward development of subprogram information transfer plans. However, followthrough plans have not been explicitly stated and budgetted for. At present, CREDA staff have a number of ideas for followthrough, but little has been developed in the way of explicit plans.

Strategy #2: **Conduct technical demonstrations on as small a scale and with as little initial visibility as possible.**

This strategy applies primarily to demonstrations in which there is considerable technical risk, and is designed to prevent embarrassing high-profile failures due to technical considerations. The strategy has been well pursued in New Brunswick, and the cautious approach has paid off — there have been no public technical failures.

Strategy #3: **Conduct several demonstrations in parallel, addressing the same problem, if budgetary constraints will allow.**

This strategy appears to have been pursued, especially in the retrofit and wood subprograms (i.e. arenas, restaurants, museum and convenience store retrofits; wood chip burner/boiler projects). Parallel demonstrations increase the reliability of final conclusions.

Strategy #4: **Do not emphasize large projects at the expense of small ones.**

This strategy has also been pursued. Most of the projects have been small in scale and limited in scope. Funding of large projects has been appropriate in that these have generally been national demonstrations (e.g. Mount Allison retrofit, Surface Heated Greenhouse).

Strategy #5: **Resist political pressure to demonstrate before a technology is well in hand.**

There has been no political pressure to demonstrate particular technologies.

Strategy #6: **Allow enough time in a demonstration's schedule for slippage.**

This strategy has not been adequately employed in the later stages in the Program, as a desire to achieve as much as possible within the remainder of the Agreement appears to have resulted in unrealistic scheduling of recently approved projects. The compression in the project cycle projected by Energy Secretariat staff was clearly seen in Figure 2.1. One reason for unrealistic scheduling was the confusion surrounding the precise termination date of the Agreement; for some time, Management Committee operated under the assumption that work on projects could proceed until September 30, 1984. However, even taking into account this misunderstanding and the shortening of the project cycle that would be expected to occur as the Secretariat has gained experience, it is clear that the schedules projected for projects such as the Lake Utopia Anaerobic Wastewater Treatment installation do not allow sufficient time for "slippage" and inevitable delays.

Thus a subjective review indicates that the New Brunswick program has established most of the preconditions for success in achieving CREDA objectives. In the following sections, an attempt is made to quantify the achievements to date of the Program.

3.8.2 Quantification of Objectives Achievement

It is not possible to precisely quantify the degree to which the New Brunswick CREDA program has achieved its objectives, for several reasons:

a) the majority of projects have not yet been completed. As of May 31, 1983, reports containing final data had been received by the Secretariat for only 6 projects. Since it appears that most potential replicators await final report results before deciding to

replicate, it is clearly too early to judge the results of CREDA in New Brunswick. In most cases it is too early even to judge the results of individual projects.

b) mechanisms for gathering data on the impact of projects and on replication have not generally been built into projects, and thus the data necessary for a quantitative assessment are not available.

However, while it is difficult to accurately judge program effects, certain operational outputs can be measured. These are discussed below.

a. OPERATIONAL OUTPUTS

i) Proposals Processed

Accurate records of the number of inquiries received have not been kept, but Secretariat staff estimate that the ratio of inquiries received to proposals processed is approximately 3:1. Some 58 large scale projects have been awarded funding; 50 of these are active. Another 97 proposals were rejected or withdrawn. Eight small-scale projects have been funded through the regular approval mechanism, while 63 projects have been funded (from approximately 400 proposals) under the small scale subprogram.

One hundred and seven proposals are classified as inactive. Of these, 10 were referred to the small scale subprogram, 37 were withdrawn by proponents for various reasons, 32 were rejected by the Energy Secretariat and 28 were rejected by EMR. A breakdown of reasons for proposal rejection is given in Table 3.3.

ii) Turnaround Cycle

As discussed in Section 2.2, the mean total turnaround time for proposals is 3 to 5 months; this could be shortened if the uncertainties concerning project selection criteria were reduced. The project turnaround cycle of course varies considerably with the nature of the project, and none of the projects are finished in terms of information transfer. However, as the Energy Secretariat has gained experience, and particularly as monitoring and information transfer activities have become streamlined, the project cycle appears to have shortened.

iii) Information Transfer Activities

A summary of information transfer activities for large scale projects is provided in Table 3.4. It is clear from this table that New Brunswick has been very active in the area of information transfer, and that information transfer activities have been exemplary. New Brunswick's information materials have frequently been used as models by other provinces with CREDA programs.

However, as discussed in Section 2.4, there is insufficient time remaining in the current Agreement to complete information transfer activities for the majority of projects. This is borne out by Table 3.4, which indicates how few final reports have yet been received.

b. PROGRAM OUTPUTS

i) Financial Highlights

The current financial status of the program was discussed in Section 3.1 and Appendix C. Table 3.5 compares the current distribution of funds with that originally projected in a 1980 CREDA budget document. From the table it is clear that the priority given to renewable energy has decreased, but that allocations for conservation in general are in line with the original projections.

Within the conservation subprogram, heat recovery, general conservation (including energy efficient new construction and energy management) and transportation in particular are all underspent relative to the original projections, while spending on retrofit has been much greater than originally projected.

Within the renewables subprogram, spending on wood has been generally in line with the original projections, but all other renewables have been considerably underspent compared with the early budget estimates.

The addition of the small-scale subprogram and increases in administration, as well as supplementary funding of monitoring and information transfer account for the remainder of the funding.

TABLE 3.3

Proposal Rejection at Provincial and Federal Levels

Reason for Rejection	# Proposals Rejected By: Secretariat	EMR	Total	% of Total Rejected Proposals
1. Poor Economics/ Little Replication Potential	10	7	17	28.3
2. Proposed work R&D or Feasibility rather than Demo.	9	2	11	18.3
3. Too similar to previously funded projects/not unique	7	6	13	21.7
4. Proponent would proceed with project anyway/technology sufficiently demonstrated	-	7	7	11.7
5. Eligible for other government assistance programs	2	3	5	8.3
6. Technically unsound	1	1	2	3.3
7. Other	3	2	5	8.3
	32	28	60	100.0

TABLE 3.4

Summary of Information Transfer Activities for Large Scale Projects as of May, 1983

Activity	# Completed	# Completed by Secretariat but not yet issued	Remainder
Press Releases (Project announcements)	35	10	9*
Project Summary Sheets	36	6	8*
Brochures	6	4	40
Data input into QL system	19	-	33
Signage	32		
Final Reports	2	4	40
Seminars/workshops	5	-	-
Photos	30	7	8
Site Visits	19	-	33
Media Coverage	34	-	18

* The majority of these appear to be projects which are approved but not yet signed.

NB Totals are not always identical because certain projects lend themselves only to selected information transfer activities.

TABLE 3.5

Comparison of Actual versus Forecast
Budgetary Allocation by Energy Sector

Subprogram/ Sector	Approvals to May 31/83 $	Approvals to May 31/83 % of Total	1980 Budget Forecast $	1980 Budget Forecast % of Total
Retrofit	2,533,415	28.8	1,100,000	9.8
Heat Recovery	1,257,110	14.2	2,000,000	17.8
General Conservation	613,104	6.9	1,800,000*	16
Transportation	24,000	0.3	1,000,000	8.9
SUBTOTAL	4,447,629	50.2	5,900,000	52.5
Renewables				
Wood	1,663,508	18.8	2,000,000	17.8
Solar	304,374	3.4	700,000	6.2
Wind	15,000	0.2	250,000	2.2
Low-Head Hydro	-	0	400,000	3.6
Biomass	400,000	4.5	1,080,000	9.6
SUBTOTAL	2,382,882	26.9	4,430,000	39.4
Small Scale	827,832	9.4		
Total Conservation and Renewables	7,658,343	86.5		
Other				
Administration	1,041,731	11.8	920,000	8.1
Monitoring	56,000	0.6		
Information Transfer	100,000	1.1		
GRAND TOTAL	8,856,074	100	11,250,000	100

* Includes allocations for energy efficient new construction and energy management. The addition of the small-scale subprogram and increases in administration, as well as supplementary funding of monitoring and information transfer account for the remainder of the funding.

ii) Gross Energy Impact

The relevant energy impact of the program will of course be determined by the degree of replication activity. Because most of the individual projects are not yet complete, data on their actual energy impacts are not available. The expected impacts of approved projects are shown in Table 3.6. (All projects are not shown on the table because quantitative impacts cannot be estimated for certain types of projects, e.g. wood harvesting projects and feasibility studies).

It can be seen from the table that the total expected annual energy impact of quantifiable projects amounts to some 648,615 GJ of energy conserved or substituted. In most cases, data are not yet available on the energy impacts actually achieved. The ultimate impact will depend on replication rates.

iii) Jobs Created and Industrial Impact

The long term job creation impacts of the CREDA program will depend on the degree of project replication. The program has created a number of short term jobs in project construction and management. Currently 13 persons at the Energy Secretariat and RPC are primarily engaged in CREDA related work; over the course of the agreement an estimated 40 person-years of work was involved.

It is possible to generate only very rough estimates of the short-term job creation of the various projects, because no records have been kept of jobs created, and labour costs have generally not been listed separately in most proposals and contracts. The consultants therefore

TABLE 3.6

Expected and Achieved Gross Energy Impacts of CREDA Projects in New Brunswick*

Project	Title	Annual Energy Savings** in Gigajoules		Type of Energy Saved/Replaced	Replication to Date
		Expected	Achieved		
2001	Conserver House	334	334 (est.)	Light Fuel Oil	Yes (of parts)
2002	Vanpooling	7,300	1,450 (est)	Gasoline	None known
2003	Waste Heat Aquaculture	51,000	51,000 (est)	Propane	None known
2004	Energy Efficient Fish Hatchery	10,500	Not yet known	Heavy Fuel Oil	None known
2005	Solar Hot Water Heating	36	Not yet known	Electricity	None known
2006	Wood Chip Burner	5,800	Not yet known	Light Fuel Oil	Yes (2 units)
2007	Super Energy Efficient Residences	80	Not yet known	Electricity	None known
2009	Solar Hot Water Heating	1,436	Not yet known	Fuel Oil	None known

* Does not include projects recently approved under Phase II of Small-Scale Subprogram.
** "Savings" includes both direct savings through conservation and substitution by renewable sources.

Project	Title	Annual Energy Savings** in Gigajoules		Type of Energy Saved/Replaced	Replication to Date
		Expected	Achieved		
2010	Heat Recovery	3,016	Not yet known	Propane	None known
2013	Wood Chip Boiler	15,750		High Quality Firewood	None known
2014	Wood Chip Heating	680	Not yet known	Heavy Fuel Oil	None known
2016	Kort Nozzle	1,760		Diesel	None known
2017	Asphalt Recycling	N/A	340*	Fuel Oil Also 6,530 tonnes virgin aggregate and 297,700 litres asphalt cement	Yes (at least 3)
2021	Sawdust Burner	5,600	Not yet known	Heavy Fuel Oil	None known
2024	Wood Chip Burner	15,175	Not yet known	Heavy Fuel Oil	Yes (one unit)
2027	Arena Retrofits	760 1500	Not yet completed, but savings achieved appear to be close to those expected	Fuel Oil Electricity	None known
2029	Cogeneration and Aquaculture	22,240	Not yet known	Coal	None known
2032	Energy Management	10,000 11,600	Not yet known Not yet known	Heavy Fuel Oil Electricity	None known

* Savings are once-only rather than annual.

Project	Title	Annual Energy Savings** in Gigajoules		Type of Energy Saved/Replaced	Replication to Date
		Expected	Achieved		
2034	Wood Chip Heating Systems	460	Not yet known	Fuel Oil	Yes (2 units)
2035	Institutional Energy Efficient Retrofit	46,850 75,600	Not yet known	Heavy Fuel Oil Electricity	None known
2036	Commercial Energy Efficient Retrofit	370	Not yet known	Electricity	None known
2037	Surface Heated Greenhouse	5,400	Not yet known	Heavy Fuel Oil	None known
2042	Commercial Retrofits	1,550	Not yet known	Electricity	None known
2043	Wood Chip Heating	4,400	Not yet known	Light Fuel Oil (No. 2)	None known
2044	Office Energy Efficient Retrofit	130	Not yet known	Electricity	None known
2046	Wood Chip Heating	1745	Not yet known	Fuel Oil	None known
2047	Wood Residue Boiler - UNB	288,300	Not yet known	Fuel Oil	None known
2048	Restaurants Energy Retrofit	562 1,188	Not yet known	Light Fuel Oil Electricity	None known
2049	Ground Water Source Heat Pump	379	Not yet known	Fuel Oil	None known
2051	Co-op Housing Retrofit	1,332	Not yet known	Electricity	None known

Project	Title	Annual Energy Savings** in Gigajoules		Type of Energy Saved/Replaced	Replication to Date
		Expected	Achieved		
2052	Museums Retrofit	720	Not yet known	Electricity	None known
2054	Anaerobic Wastewater Treatment	41,730	Not yet known	Heavy Fuel Oil	None known
2055	Swimming Pool Heat Recovery and Dehumidification	1,278	Not yet known	Electricity	None known
2058	Heat Recovery in Police Station	479	Not yet known	Electricity	None known
101	Passive Solar Addition	43	43	Electricity	None known
103	Solar Assisted Greenhouse	22	22	Light Fuel Oil	None known
104	Energy Efficient Home	104	104	Electricity	None known
105	River Source Heat Pump	211	Not yet known	Light Fuel Oil	None known
107	Ground Water Source Heat Pump	105	Not yet known	Light Fuel Oil	None known
201	Retrofit	88	Not yet known	Fuel Oil	None known
202	Retrofit	26	Not yet known	Fuel Oil	None known
204	Retrofit	99	Not yet known	Fuel Oil	None known
205	Retrofit	44	Not yet known	Fuel Oil	None known
206	Heat Pump	64	Not yet known	Electricity	None known

Project	Title	Annual Energy Savings** in Gigajoules		Type of Energy Saved/Replaced	Replication to Date
		Expected	Achieved		
207	Heat Pump	120	Not yet known	Fuel Oil	None known
208	Heat Pump	70	Not yet known	Electricity	None known
209	Tankless DHW	18	Not yet known	Propane	None known
211	Electric Car	55	Not yet known	Motor Gasoline	None known
212	Heat Exchanger	30	Not yet known	Electricity, Wood	None known
213	Electric Car	39	Not yet known	Motor Gasoline	None known
214	Energy Efficient Landscaping	39	Not yet known	Fuel Oil	None known
216	Jetstream	193	Not yet known	Fuel Oil	None known
217	Boiler	9,484	Not yet known	Heavy Fuel Oil	None known
218	Wood Gasification	47	Not yet known	Motor Gasoline	None known
219	Active Solar	60	Not yet known	Electricity	None known
221	Active Solar	43	Not yet known	Electricity	None known
222	Active Solar	7.6	Not yet known	Electricity	None known
223	Active Solar	2.2	Not yet known	Electricity	None known
224	Active Solar	18 79	Not yet known Not yet known	Electricity Fuel Oil	None known
225	Passive Solar	39	Not yet known	Fuel Oil	None known
226	Passive Solar	21	Not yet known	Fuel Oil	None known

Project	Title	Annual Energy Savings** in Gigajoules		Type of Energy Saved/Replaced	Replication to Date
		Expected	Achieved		
227	Passive Solar	79	Not yet known	Fuel Oil	None known
228	Passive Solar	21	Not yet known	Fuel Oil	None known
229	Wind	49.5	Not yet known	Electricity	None known
230	Wind	72	Not yet known	Electricity	None known
231	Wind	47	Not yet known	Electricity	None known
232	Wind	9	Not yet known	Electricity	None known
233	Wind	17	Not yet known	Electricity	None known
234	Small Hydro	110	Not yet known	Motor gasoline	None known

developed a method of estimating job creation based on a number of key assumptions.

Assuming the labour content of CREDA projects to be about 50% of project costs, and assuming an average annual salary and benefit package of $30,000 per year then approved CREDA projects* can be expected to have supported approximately 96 person-years of employment by the time their project cycles have been completed. However, these are short-term jobs rather than stable employment opportunities. Long term employment creation is entirely dependent on replication rates. Also, in a number of cases, new jobs were not created. For example, boiler operators were required in wood combustion projects, but since these operators would be required to operate conventional boiler equipment in any case, no jobs were created. On the other hand, an unknown number of new jobs were created in wood harvesting, processing and distribution, because these were new activities. Similarily, new jobs created by the replication of wood projects would be primarily in fuel harvesting, processing and distribution.

However, at this point in time, estimates of job creation must be treated as order-of-magnitude estimates only. It is recommended that in any further projects, proponents be requested to provide estimates of person-weeks of employment to be created in the same way that they are currently asked to provide estimates of energy savings. This would greatly facilitate future efforts to quantify employment impacts.

In addition to short term job creation, 4 projects have resulted in the creation of new industrial enterprises with long-term job creation potential:

* Small-scale projects are not included in this estimate because the labour component in most of these projects was volunteer labour provided by the proponents.

- a new company (Grand Lake Resources) has been created by N.B. Coal to run both the aquaculture and greenhouse operations as long-term commercial enterprises.

- Key Industries is producing and marketing the "Energy Blanket" hot water heater insulator as a commercial item, employing eleven persons (including a number of handicapped individuals).

- Rundle Industries is actively pursuing the commercialization of the WOODCAN stoker.

Benefits to existing industries cannot be quantified, but the major impacts appear to be on the forestry sector through the Wood subprogram. The consulting industry has also benefitted through the development of new energy-related skills and experience as a result of employment on CREDA projects.

c. PROGRAM EFFECTS

i) Commercial and Market Penetration of Key Technologies

Market penetration can only be traced for technologies actually developed under the CREDA program. For other technologies (e.g. retrofit measures, heat recovery devices), it is not possible to determine the precise impact of CREDA on market penetration because of the variety of other programs and market forces which also influence the rate of penetration.

Three technologies can be identified as having been primarily developed through the New Brunswick CREDA program: the WOODCAN stoker, the Arvin chipper, and the Energy Blanket. Market penetration by the first two has been minimal to date — no more than two WOODCAN

units have sold other than through CREDA, and little has been been done as yet to commercialize the Arvin chipper. The Energy Blanket can be considered to be commercialized; some 360 units had been sold as of March 1983.

ii) Replication Activity

It is difficult to quantify replication activity because CREDA has not put in place a system by which replication activity directly attributable to projects can be traced. For example, proponents have not been required to record names and addresses of visitors to projects; thus there is no possible means of following up to see if visitors subsequently took any action to replicate. Similarly, early seminar participant questionnaires were not designed to permit easy follow-up and assessment of replication activity. (This has improved, however: the questionnaire used at the recent arena retrofit seminars was designed to permit follow-up, and assessment of replication and barriers).

Most importantly, the majority of projects have not yet been completed. Since discussions with proponents and CREDA staff indicated that most potential replicators require final report data prior to making the decision to replicate, it is clearly too early to judge replication activity.

Known instances of replication were indicated in Table 3.6. Some 5 projects are known to have been replicated to date; since there is no system for tracing replications, there may indeed be other instances which have not come to the attention of CREDA staff or project proponents.

iii) Oil Substitution Impacts

From Table 3.6, it can be seen that CREDA projects are expected to conserve or substitute for 514,126 gigajoules of petroleum products (equivalent to 84,021 barrels of crude oil). As most projects are incomplete, it is not yet known if these expected savings will be achieved.

The real oil substitution impacts of the program have yet to be felt, however. The magnitude of the long term impacts will depend on the rate of replication of oil substitution projects.

iv) Impact on Energy Security Targets

National energy security targets are defined in the National Energy Program as "independence from the world oil market by 1990". This is to be accomplished by reduction of the use of oil in each of the residential, commercial and industrial sectors in every province to no more than 10 per cent of the total energy used in those sectors.

Oil is thus clearly the focus of energy security targets. This is particularly true in New Brunswick, where oil accounted for 71.9% of total energy consumed in 1981.* The province is already self sufficient (i.e. it produces all it consumes) in natural gas and wood, and produced a surplus of coal and wood residue. As the province has for the past 25 years acted as an electricity "broker,** electricity supply does not appear to be a major problem.

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* New Brunswick Energy Review, 1982.

** Branch, S. "New Brunswick Energy Update". The Atlantic Advocate, June 1983.

In 1980 New Brunswick consumed some 164,553 terajoules (26,545,000 barrels) of oil. Transportation accounted for 30.9% of this; the sectors targetted for reduction in consumption therefore consumed 18,342,600 barrels. Reduction of this to 10% by 1990 therefore necessitates a reduction in consumption of some 16.5 million barrels of oil annually.

Review of the oil substitution impacts discussed above indicates that CREDA has had little impact relative to energy security targets (0.5% of the oil substitution goal has been achieved directly by CREDA projects). Once again, significant impacts await more extensive replication. It should be noted, however, that the wood projects are the major contributors to oil substitution; this is beneficial in light of New Brunswick's surplus of wood residues.

v) National and International Marketing

No records have been kept of national and international marketing by the CREDA office or by project proponents. Only a subjective assessment can therefore be provided.

The New Brunswick CREDA Information transfer staff appear to have been conscientious in maintaining contact with other CREDA offices, chiefly by mailing copies of project summary sheets and other project documentation as they are produced. Any material received from other provinces is also passed on to potential users (e.g. data from CREDA-sponsored arena retrofits in the Yukon were passed on to the arena retrofit consultants). New Brunswick has also been actively involved in the discussions surrounding the development of a National Information Transfer Plan for CREDA. International efforts have largely been confined to sporadic contact with American organizations but the wood subprogram has attracted the attention (and visits) of French biomass energy planners and representatives of the Government of Portugal. The Waste Heat Aquaculture project has been visited by representatives from Ireland.

National and international marketing has also been taking place at the proponent level through participation in industrial and professional associations. Wherever appropriate, proponents are encouraged to prepare presentations for association conferences and meetings, and a number appear to have done so.

In general, given the resources available, New Brunswick's national and international marketing efforts have been satisfactory. As more projects are completed and the Agreement deadline approaches, however, more attention may need to be given to this aspect of information transfer.

4.0 EXTERNAL IMPACTS ON CREDA

Chapter 3 has concerned itself with a review of CREDA from within the Program. That is, it has evaluated the process of administration of the Agreement and reviewed the project cycle as it affected the overall program. This chapter will explore the Program from an external perspective, looking at issues, barriers and constraints which have acted from outside the Agreement. These are factors which are sometimes beyond the scope of the Agreement to address but nevertheless impact on its overall effectiveness. As well, recognition of these factors can influence program strategies to avoid the negative effects of the externalities.

4.1 Policy Support

The relevance of CREDA objectives must be assessed in the context of the policy those objectives are designed to foster. A demonstration program is, after all, a policy instrument.

National energy policy objectives are stated in the National Energy Program (NEP) as being:

- Security of oil supply.
- Opportunity for Canadians to participate in their oil and gas industry.
- Fairness in the distribution of energy benefits and burdens.

The NEP states quite clearly that "Canada's energy problem is oil... The goal is independence from the world oil market by 1990". Conservation of oil is a clear policy objective, conservation of other energy forms is desirable in that it frees this energy for use in substituting for oil. "The National Energy Program takes the view that conservation provides the cleanest, most enduring, and - in many instances - the cheapest part of the solution to the

oil problem of the 1980's and to an improvement of the basic energy balance." Renewable energy receives much less emphasis in the NEP, but nevertheless is considered to be one component of the energy supply equation. Inasmuch as conservation and renewables increase security of energy supply, therefore, CREDA is clearly an instrument of federal energy policy.

In the province, support for conservation and renewables has not been as clearly stated. Historically, the New Brunswick Electric Power Commission (N.B. Power) has been the primary public body concerned with energy. Its focus has naturally been on electric power supply; in the absence of a stated energy policy, the de facto policy has thus been built around electricity supply.

The limited attention historically given to conservation and renewables is underscored by the fact that at the time of the inception of CREDA in New Brunswick, the Energy Secretariat had been recently created and was staffed by only two people. Thus a major program (CREDA) emphasizing energy conservation and alternative supply options was suddenly introduced into a province which had traditionally dealt only in conventional energy supply options, to an understaffed and newly formed energy agency which had neither the experience nor the policy mandate to immediately implement a strong program.

The response of the Secretariat was to slowly build a staff complement as needs became apparent and to gradually rationalize program direction (or policy) as the most effective projects became apparent. Under the circumstances this approach is the best one that could have been taken. Today the Secretariat boasts an experienced, well coordinated staff with strategic direction provided by the three subprograms.

The relative lack of provincial renewable energy activity outside of CREDA is, however, still apparent. Clearly, the task of implementing a CREDA program provincially would be enhanced by parallel provincial policy

initiatives, and additional provincial program support. In evaluting the program it must be noted that a side-benefit of CREDA has been the de facto strengthening of conservation and renewable energy policy in New Brunswick. It is not clear when or to what extent this policy would have developed without the CREDA impetus.

4.2 Externalities and Other Constraints

Demonstration programs take place in a "real world" environment, in which all the variables cannot be controlled. Externalities can influence the success of even the best-planned demonstration. A fair evaluation of the effectiveness of the New Brunswick CREDA program must therefore take into account the environment in which the program must be implemented.

The constraints imposed by the relative lack of provincial policy support have already been discussed. Also, as discussed in Chapter 2, without the benefit of early institutional support, front-end planning appears to have suffered as a result of staff limitations in the first years of the program.

Economic factors are a crucial externality. Economic recession, high interest rates, etc. can create serious barriers to replication of demonstrations which in more favourable economic climates would result in rapid diffusion. This is particularly important in a province such as New Brunswick, which has traditionally been considered a "have not province".

Fluctuation in world oil prices is another externality over which CREDA has no control, but which greatly influences the commercialization of conservation and renewable energy. Thus technologies which were attractive prospects for demonstration when regular oil prices increases were assumed are much less attractive prospects for commercialization now that world oil prices have temporarily stabilized.

A major constraint to CREDA's effectiveness is, of course, time. While time deadlines can be predicted in a way that other externalities cannot, they still create an artificial pressure which can seriously impair the effectiveness of a demonstration. Time constraints have perhaps been more severe in New Brunswick because considerable time was needed to build up the kinds of infrastructure and expertise which were already present in provinces with established energy departments. This fact should be taken into account in any review of agreement deadlines.

However, there is some evidence that the magnitude of the time constraints has not been fully appreciated by Management Committee. A number of recently approved projects clearly cannot be properly completed (including information transfer) by the Agreement deadline (see Figure 2.1). This can be explained in part by the fact that the nature of the so-called "grace period" between March and September 1984 was misinterpreted until recently. However, a number of projects clearly cannot be properly completed even by September 1984, and new proposals are being considered for funding when it is apparent that their project cycles cannot be completed by September 1984. The schedules being projected for recently approved projects allow no time for "slippage", despite the evidence from past projects that unavoidable delays do occur.

Thus, while time has definitely been a major constraint, it is a constraint over which Management Committee has some control, in that deadlines were clearly stipulated at the beginning of the Agreement.

4.3 Other Barriers to Diffusion

A major aim of CREDA is to remove informational barriers to commercialization of conservation and renewable energy technologies. However, discussions with project proponents about potential replicators clearly revealed that in a number of cases there are other serious barriers to the replication of demonstrations and the diffusion of technologies.

Information is frequently necessary, but often not sufficient, to accelerate commercialization.

A number of barriers to diffusion were outlined in Section 1.4. Chief among these were lack of information, financial constraints, institutional barriers, environmental barriers, timing and commercial viability, and lack of an established after market service structure or supply infrastructure.

Clearly demonstration projects cannot remove all these barriers. They can, however, identify barriers other than those (e.g. information barriers) they are designed to address. The practical institutional problems encountered in carrying out demonstrations, for example, can highlight where institutional barriers exist and lead to policy change. The incorporation of elements of market study into demonstrations can lead to clear identification of financial barriers to replication.

However, while demonstrations are a useful mechanism for identifying various barriers to replication, a demonstration program cannot address and solve all these impediments. Demonstrations tend to be most effective when diffusion is hampered in the main by a lack of knowledge in the hands of potential adopters about the use of the technology under practical operating conditions.

CREDA is thus faced with a dilemma particularly at the project selection phase, because there appear to be few conservation and renewable energy technologies for which lack of information is the only important barrier to diffusion. Financial constraints were frequently cited by project proponents and potential replicators; availability of capital is clearly a barrier in New Brunswick's current economic environment. Within private sector companies, energy investments are frequently considered to be less attractive uses for scarce capital than production-related investments.

Thus technologies which are attractive from a social point of view may not necessarily be attractive to individual investors because of financial and other constraints. There may be a lack of "market pull" for technologies which, if disseminated, could contribute to the achievement of national energy policy objectives. In other words there is not enough evidence to suggest that one time demonstration projects can induce potential adoptors to immediately invest private money in the conservation and renewable sector, especially in tight economic conditions. Other commercialization - type programs are required to close the gap between a demonstrated technology and widespread private sector investment.

There appears to be a need for development of a more comprehensive demonstration-to-commercialization "package" to overcome the various barriers to diffusion of conservation and renewable energy technologies. (This issue is discussed at more length in the following section). At the same time, project objectives should be clearly defined at the proposal assessment phase; the process of defining objectives by its very nature forces a consideration of what the real barriers to dissemination of a particular technology are. Projects should be designed to identify both those barriers which can be addressed within the limitations of CREDA and those which require action beyond CREDA's mandate. (This is already being done through the Wood Subprogram, which has attempted to address supply and distribution barriers to wood chip combustion. CREDA has also, through its impacts on the development of expertise in conservation and renewables, helped reduce one barrier to diffusion, namely the lack of skilled personnel in a new field of work.) In this manner, problems which a demonstration program such as CREDA cannot address can be brought to the attention of agencies which can more effectively deal with them.

4.4 Related Programs and Institutional Coordination

It has been noted that for a number of socially attractive conservation and renewable energy technologies, lack of information is not the only barrier to

diffusion. A number of federal programs attempt to address other barriers to commercialization; these are listed in Appendix D.

The major programs which attempt to address financial barriers are AECIP, FIRE and the recently-developed Canercon. Each of these programs, however, addresses only a limited portion of the spectrum of financial barriers. Several proponents mentioned that AECIP's effectiveness is limited by the fact that investors must still raise 50% of the capital required, which can be a difficulty for capital-short industries. Another limitation is the ineligibility of municipalities. (This has implications for the replication potential of projects such as the arena retrofit). The imminent expiry of AECIP is another obvious limitation to its effectiveness as a follow-on program to CREDA. FIRE is limited to biomass; Canercon is not yet fully on-stream, and is limited to energy conservation audit and retrofit in the commercial, small industrial and institutional sectors.

Follow on financing for replication of CREDA projects thus appears to be fragmented and sector-specific. CREDA can refer potential replicators to these programs (and there is evidence that New Brunswick CREDA has been doing so), but the current system has clear weaknesses in that the sectors and technologies targetted by the financing programs are not always the same as those targetted by CREDA projects. CREDA could potentially be much more effective if it were integrated into a comprehensive package designed to address all the major barriers to diffusion of appropriate new energy technologies.

Within current limitations, however, all possible efforts should be made to coordinate with other federal and provincial programs. There is evidence that attempts have been made in New Brunswick to do so. For example, a number of wood energy proposals submitted to CREDA have been referred to the FIRE program for funding. CREDA has also coordinated with NEAP and AECIP on occasion (e.g. the arena retrofit seminars).

Provincially, considerable efforts have been made to coordinate CREDA with the activities of other provincial departments. CREDA has coordinated with the Department of Natural Resources (Forestry) in the development of the Wood Energy Program, and has attempted to involve the Department of Fisheries in the development of the Fisheries Energy Management Plan. The involvement of the Department of Youth, Recreation and Cultural Services in the arena retrofit project is commendable because DYRCS is one of the few potential sources of funding assistance available to municipalities wishing to replicate the retrofit projects.

Other examples of coordination include the involvement of the Department of Commerce and Development in stoker and heat pump projects, Agriculture in greenhouse projects, N.B. Housing in retrofits, and coordination with environmental agencies in projects involving anaerobic processes and biogas production. These and other provincial departments and agencies (e.g. C.I.C., N.B. Power) have also been contacted when appropriate to assist in identification and involvement of target audiences.

This coordination should be continued and strengthened wherever possible, because it increases the chance that potential replicators will obtain financing assistance and encouragement. Coordination with relevant innovation and development programs is also desirable to prevent duplication of effort and generally facilitate the demonstration process. CREDA has been coordinated with IRAP (one proponent sought additional assistance from mini-IRAP to improve development work being done on a CREDA project), but generally there does not appear to have been too much interaction between CREDA and the other innovation and demonstration programs. Some of the proposals and projects currently being considered by CREDA in New Brunswick (e.g. waste incineration in Sussex, City of Fredericton Composting, Lake Utopia Anaerobic Wastewater Treatment) may have potential for integration with DRECT, for example. (See Appendix D for program explanations).

However, the fact remains that the limited financing mechanisms currently available to potential replicators fail to adequately address financial barriers to the diffusion of many conservation and renewable energy technologies. As a result, the potential effectiveness of CREDA as an instrument of national energy policy is seriously limited. A demonstration program should be only one element in a national commercialization strategy. There appears to be a clear need for development of other elements (especially financing packages) in order that a comprehensive and effective approach may be taken to the commercialization of conservation and renewable energy technologies.

4.5 Objectives and Expectations of the Agreement

Technology commercialization is a dynamic, high-risk process, particularly in today's volatile energy environment. Circumstances change rapidly (e.g. fluctuations in world oil prices) and policy responses must be constantly modified. It is therefore appropriate, as part of a mid-term evaluation of CREDA, to examine whether the objectives of the Agreement are still relevant.

CREDA appears to have been originally predicated on the assumption that lack of information was one of the major barriers to commercialization of conservation and renewble energy technologies. While this assumption is still valid in many cases, it clearly does not hold for all conservation and renewable energy technologies. Certain technologies (e.g. active solar space heating) produce energy at a cost so much greater than that of producing energy by conventional means, that they will not be ready for commercialization until the costs of competing energy sources are much higher. At the time CREDA was developed, conventional wisdom dictated that costs of conventional energy (in particular oil) would continue to rapidly increase. Given this assumption, the commercialization potential of a wide variety of unconventional energy sources appeared attractive.

The recent stabilization of world oil prices, however, forces a reevaluation of that fundamental assumption. While it is impossible to predict with

certainty the future price of conventional energy, it is clear that it is unwise to base predictions of the future viability of energy technologies on the assumption of increases in the price of competing energy sources.

It has also been shown that those technologies which do appear commercially attractive now face other barriers to replication apart from information.

The CREDA objective of demonstrating a wide range of conservation and renewable energy technologies may thus no longer be appropriate. However, the objective of accelerating commercialization of technologies which are potentially economically attractive is clearly relevant. Increasing efficiency through cost effective conservation measures is clearly desirable from an economic point of view. Likewise, the use of cost-competitive indigenous renewable energy sources to substitute for imported energy such as oil is desirable because of its foreign exchange, domestic employment and energy security impacts.

Technical demonstrations (i.e. those which would not have such immediate commercialization potential or opportunities for economic payback) still have their place in CREDA. In keeping with federal procedures, however, the specific technical projects need to be selected with clear objectives in mind to avoid duplication of effort in other parts of the program and to obtain the required technical information.

Thus CREDA's objective of accelerating technological commercialization is relevant as it applies to technologies which are (or are very close to being) cost competitive now, and for which information appears to be the main barrier to diffusion. However, if this objective is to be relevant in a broader sense, (i.e. the development and commercialization of a wide variety of conservation and renewable energy technologies in order to achieve national energy policy objectives), more effective follow-on measures must be developed to address financial and other barriers which cannot be dealt with by a demonstration program.

5.0 CONCLUSIONS AND RECOMMENDATIONS

A number of conclusions can be drawn from a review of CREDA experience in New Brunswick, and the most important of these are summarized below. However, recommendations for future direction and action must be heavily influenced by assumptions concerning the termination date of CREDA. Obviously, if the Agreement is extended beyond the current deadline of March 31, 1984, considerably more changes can and should be made to the manner in which the Program is implemented.

The summary of conclusions is therefore followed by several alternate series of recommendations, based on different assumptions about the time frame of the Agreement. No matter what decision is ultimately made concerning the future direction of CREDA, however, certain basic conclusions must be drawn.

5.1 Conclusions

5.1.1 Increased Rationalization of the Project Cycle

The New Brunswick CREDA Program appears has evolved considerably with respect to its handling of the project cycle. The first two years were characterized by "learning by doing" and by a less structured approach to the various phases of the project cycle. In the latter half of the Program organization and management procedures have greatly improved, and a more sophisticated and structured approach is being taken to the project cycle phases.

5.1.2 Proposal Assessment and Project Selection

Treatment of this phase of the project cycle has improved considerably since the early days of the Program. Standardized routines have been developed for the review of proposals, and the definition of priority

subprograms has provided greater direction for prioritization in project selection.

However, several weaknesses remain; these appear to be due primarily to a lack of attention to clear definition of project and subprogram objectives. Criteria for project selection are not clearly defined at either the provincial or federal levels. As a result, misunderstandings have occurred with respect to what sorts of projects are likely to be approved and what levels of CREDA contribution are considered appropriate. This in turn has resulted in inefficiency and delays, as proposals are exhaustively reviewed by the province only to be rejected by EMR or as lengthy negotiations on funding are carried out between both governments and proponents. Insufficient attention to defining objectives has also resulted in confusion between technical and market demonstrations.

Clearly, at this stage of the project cycle, greater attention should be given to assessing what the barriers to diffusion are, whether a demonstration is in fact needed, and what the objectives and target audience of a demonstration should be.

5.1.3 Project Preparation

The Energy Secretariat's handling of this phase of the project cycle has improved. Contracts are more standardized, and more attention is given to planning and budgetting in the contract for monitoring and information transfer.

However, one concern which should be noted is that a number of recently signed contracts have listed September 30, 1984 as the final report deadline. While this has not been done since the recent clarification of Agreement deadlines, the fact remains that in several cases the province has entered into contractual agreements with proponents which extend beyond the termination date of CREDA.

5.1.4 Construction

A commendable feature of the New Brunswick CREDA Program has been the attention given to regular site visits and construction supervision. The fact that one staff member works almost full time on this aspect of project implementation ensures that construction problems are "flagged" early, and also serves to increase local awareness of CREDA and stimulate the generation of proposals.

There appear to be no major problems associated with this phase.

5.1.5 Monitoring

The Energy Secretariat has greatly increased its involvement in project monitoring as a result of problems encountered in the early "learning by doing" phase. The hiring of a full time Performance Monitoring Engineer has been a major factor in the New Brunswick CREDA Program's present exemplary handling of the monitoring phase.

The major issue with respect to monitoring is time. Complications in early projects greatly delayed the start-up of monitoring, so that proper monitoring cannot be completed for a number of these projects before March 31, 1984. Also, the monitoring schedules included in recently signed contracts tend either to be unrealistically compressed or to extend beyond the CREDA deadline.

5.1.6 Reporting

The Secretariat has in place a good system for monthly progress reporting by project managers. To date, however, few plans have been developed for review, editing, rewriting, production and distribution of final reports, a considerable number of which are due to be submitted in the coming months.

A major issue is time: many reports have been delayed, and a number of recently signed contracts indicate that reports are not due until September 30, 1984. It appears that the majority of reports will not have been submitted, reviewed and processed before the Agreement deadline of March 31, 1984.

5.1.7 Information Transfer

New Brunswick has handled information transfer extremely well insofar as operational outputs (press releases, project summaries, etc.) are concerned. The Secretariat's performance is particularly commendable in view of the fact that virtually all information material is produced in both official languages.

In response to concerns that information transfer activities for the remainder of the Agreement need to be more explicitly planned in order to achieve as much as possible in the time remaining, the Energy Secretariat has recently begun to formulate an overall plan, including budget and staffing requirements for editing, rewrites, artwork and other activities associated with final report production.

The major concern with respect to information transfer is the lack of time remaining for this essential activity. The majority of final reports will not have been received and processed before March 31, 1984. Since information transfer is geared largely around final report results, it is clear that much of the information produced through the activities of the New Brunswick CREDA Program cannot be transferred or utilized before the end of the Agreement.

5.1.8 Financial Considerations

Some 79% of Program funds had been committed to projects and miscellaneous administration as of May 31, 1983. The current state of

proposals under review could easily take up the remaining funds, but it is questionable whether many of these projects should be approved given current time constraints. Insufficient attention appears to have been given to date to budgetting and setting priorities for the remainder of the Program.

5.1.9 Subprogram Issues

The definition of priority subprograms is a positive step toward focussing on technologies with the greatest apparent potential for application in New Brunswick. The three areas being emphasized (retrofit, heat recovery and wood) are appropriate given New Brunswick's energy supply picture and the presently poor economics of harnessing some renewable forms of energy. The Wood Subprogram in particular represents a commendable effort to organize activities in a particular sector and to address a variety of barriers to the commercialization of the technologies being demonstrated. It also attempts to use energy production as a means of revitalizing an existing industry which is of great importance to New Brunswick's economy. However, the organization of the subprograms raises a number of concerns.

a) Despite the fact that retrofit projects account for the greatest proportion of project funds allocated to date, no clear, written plan has yet been developed for this subprogram. Proposals are thus being evaluated and approved in the absence of any clear criteria or defined direction. This is troubling in view of the fact that the Energy Secretariat has played an active role in developing projects under this subprogram. Projects are generally not being generated by members of the target market, the needs of this market have not been explicitly defined, and the Secretariat is generating, and Management Committee approving, retrofit projects in the absence of clearly defined priorities.

b) The Heat Recovery Subprogram plan is better defined but has several major weaknesses. The plan concentrates on technical rather than marketing considerations despite the fact that the major heat recovery technologies can be considered to be proven. Emphasis is put on demonstrating a wide variety of heat recovery technologies rather than focussing on those which would best meet the needs of the majority of New Brunswick users.

c) The Wood Subprogram is the only subprogram in which the completion of certain projects (e.g. supply and distribution) is a necessary precondition for the success of other projects (e.g. combustion). The projects carried out under the Retrofit and Heat Recovery subprograms can to a large degree stand alone; thus the implementation of all the projects planned for these subprograms is not crucial. Therefore justification for an extension of the Agreement should not be predicated on the successful "completion" of the Retrofit and Heat Recovery subprograms.

5.1.10 Quantitative Outputs

It is still too early to judge the impact of CREDA in New Brunswick because the majority of projects are not yet complete, and thus replication cannot be expected to have begun in earnest. An added difficulty is the lack of quantitative data from which replication rates can be estimated. For example, proponents have not been required to include estimates of job creation when submitting proposals, and few records of employment creation by the various projects have been kept. Proponents have not been required to keep records of project visitors; there is thus no way of knowing how many people have visited the various projects or of following up with visitors to see if they took action as a result of their visits, and if not, why not (i.e. identification of barriers).

In the long run, project-specific energy impacts are less important than the impacts of replication. However, it is interesting to note that expected annual energy savings from approved projects to date (excluding Small-Scale II) are in excess of 648 terajoules; savings in petroleum products account for 79% of this figure (equivalent to approximately 84,000 barrels of crude oil). Estimated short term employment creation from CREDA projects and administration in New Brunswick is in the neighbourhood of 136 person-years; long term employment impacts are dependent on rates of project replication. At least 3 new technologies developed under CREDA appear ready for commercialization; one (Energy Blanket) is now the basis for a business employing 11 persons.

5.1.11 Preconditions and Strategies for Success

CREDA's record in meeting preconditions which have been shown to increase the success of demonstration projects has been good. Sharing of risk with the proponent has been complicated by the impact of economic recession on proponent risk-adversiveness, and absence of time constraints is impossible in a time-limited program, but in general the preconditions have been well met.

Similarly, CREDA appears to have been employing a number of strategies which have been shown to increase the potential for successful demonstrations. The major areas of weakness appear to be related to time constraints and the increasingly tight schedules being set for individual projects.

5.1.12 Policy Issues

CREDA fits clearly into federal energy policy as detailed in the National Energy program. While New Brunswick energy policy is

less well defined, the program has received policy support at the provincial as well as the national level, although the provincial government is operating under conditions of severe budgetary restraint. A lack of staff in the first eighteen months of the program was a contributing factor in the lack of attention given to front-end planning (e.g. of information transfer and early market work), but these difficulties have been overcome. While there are limitations on the hiring of regular staff, the Energy Secretariat has been able to recruit term employees on a contract basis without difficulty.

5.1.13 Externalities and Constraints

Major external constraints on the effectiveness of CREDA in New Brunswick have been the poor economic climate of the past few years, the stabilization of world oil prices and the time constraints inherent in the Agreement. Economic recession has reduced the ability of potential replicators to invest in new energy technologies and the stabilization in world oil prices has increased the projected payback periods of most of these investments.

These externalities have inevitably influenced the manner in which demonstration projects have been planned and implemented. The poor business climate which has prevailed in New Brunswick throughout CREDA has made it difficult to find applicants and has meant that higher levels of CREDA support have often been required to ensure proponent participation. Under the circumstances, it is to the credit of the Energy Secretariat that uptake of the program has been as great as it has, especially when the lower uptake of CREDA in several other provinces is considered.

In the short term the major constraint to the effectiveness of the New Brunswick CREDA program appears to be the time deadline of

the Agreement. While there is some evidence that Management Committee has not until recently fully appreciated the magnitude of the time constraint, the fact remains that considerable time was required at the outset of the Agreement to develop the infrastructure and expertise of the Energy Secretariat. More time was probably required to do this in New Brunswick than in other provinces which already had established energy departments.

5.1.14 Barriers to Diffusion

The objectives of CREDA are predicated on the assumption that lack of information is a major barrier to the commercialization and diffusion of conservation and renewable energy technologies. While this appears to be so, it is clear that information is not the only barrier. Availability of capital, for example, appears to be a major impediment for many potential replicators. The heavy funding levels requested by many proponents are an indication of financial barriers and interviews with proponents and potential replicators confirm that these barriers can be severe.

The extent to which CREDA can obtain its objectives is limited by financial and other non-informational barriers which are beyond its mandate to rectify. The New Brunswick program has attempted, especially in the Wood Subprogram, to address institutional and infrastructural barriers, and the various CREDA projects have helped to develop local expertise in conservation and renewable energy (thereby reducing the barrier of lack of skilled personnel). However, it is clear that while demonstration programs such as CREDA can help to point out barriers other than the informational barriers they address, they are likely to be most effective when constituting but one part of a comprehensive commercialization "package". Such a package does not presently exist in Canada for conservation and renewable energy technologies, and thus the

range of technologies which can be effectively demonstrated and diffused through CREDA is more limited than national energy policy goals would appear to require.

5.1.15 Related Programs and Institutional Coordination

The New Brunswick CREDA program has attempted where possible to coordinate with other federal programs designed to assist the commercialization of conservation and renewable energy technologies; this has been accomplished primarily by referring potential replicators to financial assistance programs such as AECIP and FIRE. Commendable efforts have also been made to coordinate with provincial departments where appropriate.

However, follow-on financing programs available to potential replicators are insufficient (in terms of scope, timing, and eligibility requirements) to address the sorts of financial barriers which exist in New Brunswick. Unless a more comprehensive approach to overcoming these barriers is developed, the effectiveness of CREDA or any demonstration program in commercializing new energy technologies will be constrained.

5.1.16 Objectives and Expectations of CREDA

CREDA's objective of assisting the commercialization of conservation and renewable energy technologies through demonstration is clearly relevant to the achievement of the goals of the National Energy Program. However, changes in the world energy and economic environment (i.e. stabilization of world oil prices) suggest that CREDA's objectives should be selectively interpreted. The presence of strong barriers to commercialization which cannot be removed through the mechanism of a demonstration program currently constrains CREDA's ability to achieve its

objectives unless only a very limited range of technologies is demonstrated. If CREDA is to fulfill its potential as an instrument of national energy policy, a more comprehensive approach to addressing all the barriers to commercialization of new energy technologies is required.

5.2 Recommendations

In developing recommendations for the future direction of CREDA in New Brunswick, several possible scenarios were envisioned. Each scenario then gave rise to a particular set of recommendations.

The three principal scenarios envisioned are outlined below.

Option 1

Termination of the Agreement March 31, 1984, followed by an administrative "clean-up" period of six months. This scenario is based on the current status of the Agreement.

Option 2

Extension of the Agreement until September 30, 1986*, followed by a six-month administrative "clean-up" period: Under this scenario, no new funds

* The rationale for a thirty month extension is based primarily on estimates obtained from CREDA staff as to the time required to properly complete the project cycles of existing projects (based on realistic scheduling — i.e., allowing time for "slippage").

would be committed to the New Brunswick Program above and beyond the $11,250,000 provided through the existing Agreement. Funds for administration, monitoring, information transfer, etc. over the supplementary two and a half year period would be drawn from the $2.4 million which is as yet uncommitted under the present Agreement. New projects would only be approved if funds were available after budgets for all other activities had been drawn up and approved by Management Committee, and then only if Management Committee was convinced that the project cycles (including information transfer) could be completed by September 30, 1986.

Option 3

Full scale extension of the Agreement, e.g. extension for another five years, with additional funds (perhaps in the order of $10 million). New projects would continue to be approved with priority being given to projects fitting into the subprogram plans, as long as funding was available and Management Committee was convinced that the project cycles could be completed within the time frame of the Agreement, based on realistic scheduling.

It is recommended that Option 2 be pursued, for the following reasons:

a) Considerable time was required during the early stages of CREDA in New Brunswick to develop the staff, expertise, and administrative structure necessary to effectively implement the program. CREDA did not become focussed and begin development of a comprehensive slate of projects until 1982. Thus approximately two years of what is basically only a four-year program were required to develop the province's capability to implement the program.

   Termination of the Agreement March 31, 1984 (Option I) would appear to be inefficient and short-sighted. A considerable investment has been made, from which benefits (i.e. production

and dissemination of information) are just beginning to be realized. An extension of two and a half years, requiring no additional commitment of funds, should be sufficient to allow the majority of these benefits to be achieved.

b) Very little information is available on the impacts and effectiveness of CREDA to date, both because the majority of projects are incomplete, and because mechanisms have not been put in place to collect the data required to evaluate CREDA's performance. The degree to which CREDA has achieved its objectives can thus not be determined.

In the absence of any reliable information on CREDA's performance to date, a cautious approach should be taken to extending the time frame of the Agreement. A thirty-month extension should be adequate for completion of the project cycles of all approved projects and enable sufficient information to be gathered to permit a more quantitative evaluation of the Program's impacts and effectiveness. Such an evaluation may show that the structure or orientation of CREDA should be altered, or that policy goals can be more effectively achieved by an entirely different mechanism. In light of this, it would therefore appear to be unwise to recommend that CREDA be continued in its present form for a time period longer than that required to complete work which has already begun.

c) The potential effectiveness of CREDA appears to be limited by barriers to technology commercialization which are beyond the ability of a demonstration program to remove. It is evident that if conservation and renewable energy technologies are to fulfill their potential to reduce oil consumption and increase energy security, a more comprehensive approach to addressing all barriers to their commercialization is needed. CREDA can

accomplish only so much in isolation, and current programs to provide follow-on financing for replication of demonstrations are limited in their scope and applicability.

Under these circumstances, it is questionable whether CREDA should be continued in its present form for a lengthy period of time. A thirty month extension, however, should permit commitments made under the current Ageement to be properly met, allow a quantitative evaluation of the Program's effectiveness to be made and provide federal energy policy offices with time to develop further mechanisms to more effectively deal with non-informational barriers to commercialization.

Thus Option 2 appears to be the most appropriate response to the current situation of the New Brunswick CREDA program. Recommendations on how to implement this option in order to achieve maximum benefits are outlined below.

5.2.1 Financial Planning

Priority should be given to immediate and detailed budgetting for all activities to be undertaken during the time frame of the Agreement. Budgets should be drawn up to cover project-specific costs, administration, any such additional monitoring funds as might be required, and information transfer.

5.2.2 Additional Projects

Additional projects should only be approved if funds remain after the budget requirements of current projects, administration, monitoring and information transfer have been defined and funds allocated. If additional projects are to be approved, then a number of conditions should be met:

a) In the approval of new projects, priority should be given to the remaining projects listed in the Wood Energy Subprogram Plan as being necessary for completion of the Plan. This list comprises 4 projects with total funding requirements of $354,000 plus information transfer with funding set at $35,000.

The rationale for this recommendation is the fact that the component projects of the Wood Subprogram are much more interrelated than are projects in other subprograms and the projects as yet not undertaken (particularly the harvesting and transportation projects) are necessary preconditions to the success of a number of the projects already underway or completed.

b) If additional funding remains, preference should be given to funding projects in the other two priority subprograms of heat recovery and retrofit. Before any such projects are approved however, formal plans should be drawn up for these subprograms by the Energy Secretariat and approved by Management Committee. These plans should include the following elements:

(i) Objectives should be clearly defined, distinguishing between technical and marketing objectives. Given the nature of the technologies, the major emphasis in both subprograms should be on marketing.

(ii) Priority target audiences and apparent barriers to diffusion of the technologies should be identified. (If practical, several key representatives of the identified target audiences should be contacted during this process to provide input on needs and barriers). Based on this analysis, technologies and markets should be ranked so that priority can be given to funding projects for which market pull and

potential for success appear to be greatest (i.e. for which lack of information appears to be the major barrier to diffusion).

(iii) Based on the above, criteria for project selection and funding should be clearly defined for each subprogram. These criteria should be developed by the Secretariat in cooperation with the federal CREDA office to ensure that delays and misunderstandings during the proposal assessment process are reduced to a minimum.

(iv) Detailed subprogram information transfer plans should be drawn up, specifying primary and secondary target audiences, specific requirements of these audiences activities to be undertaken, and budgets required.

c) Additional projects should only be approved if Management Committee is satisfied that their full project cycles (including all information transfer activities) can be completed within the specified time frame of the Agreement. Project schedules should be realistically designed to leave time for "slippage".

d) During the project preparation phase of each demonstration, subject to the requirements of confidentiality for unsolicited proposals, a representative sample of the primary target audience should be contacted for comments on the proposed project and suggestions on particular issues which the project should address. (In cases involving industries represented by associations, meetings with association representatives should suffice).

e) Comprehensive information transfer plans (with budgets) should be developed for each project during the project preparation phase, coordinated where appropriate with subprogram information plans.

f) Project contracts should clearly state that proponents must consult with the Energy Secretariat prior to spending any information transfer funds.

g) Contracts should be reviewed by legal experts to avoid questionable situations such as have arisen under the present Agreement (i.e. contract deadlines extending past the Agreement deadline, discrepancies in Statements of Works, etc.)

5.2.3 Information Transfer

Information transfer requirements for new projects were outlined above. For existing projects, planning for information transfer must be a priority.

Specific and clearly defined information transfer plans should be developed as soon as possible for all individual projects or groups of related projects; this process has in fact begun. It is not recommended that the approach outlined in the CREDA National Information Transfer Plan (i.e. selective transfer of information from only the most "successful" projects) be followed. There appears to be reluctance to disseminate information from demonstrations which have "failed" in the sense that the technology involved has been shown to be unattractive or non-viable. This ignores the fact that such demonstrations have been "information successes", and that the experience and information gained from them can be extremely useful in pointing out "blind alleys" to be avoided.

The Energy Secretariat should continue to develop provisions for the review, production, and dissemination of the considerable numbers of final reports soon to be submitted. Budgets for information transfer should include allocations for the hiring of editing and writing assistance to ensure that published reports are of a consistent quality.

5.2.4 Staffing

As increasing numbers of CREDA projects complete their project cycles, the orientation of the CREDA program in general should shift from the engineering/technical orientation of the early project stages of construction and monitoring to an increased emphasis on information. CREDA's information staff is currently adequate to handle its present workload but more information staff will evidently be required as this workload increases. The budgets and plans referred to above should clearly define staffing requirements in this area, including contracting out. At least one full-time information specialist with a background in marketing should be hired to assist in identification and consultation of target audiences (especially for any new projects) and to augment the information transfer staff.

5.2.5 Data Collection

This evaluation was hampered by the lack of quantitative data on program and project outputs and effects. Systems to produce the data needed to perform a meaningful final evaluation should be put in place immediately. Specific recommendations include:

a) Proponents should be required to record names and addresses of all visitors to projects so that follow-up can be carried out to determine if any action resulted from the visits.

b) Energy Secretariat should keep a record of all inquiries received about projects and all inquiries from potential replicators.

c) Proponents should be required to submit estimates of short and long-term employment creation when submitting proposals, and quantification of actual employment creation should be required as part of the data required in final reports.

d) CREDA should augment its current co-ordination with follow-on programs such as AECIP, FIRE and Canercon such that those programs are aware of what CREDA projects are underway and can identify which applicants under these programs appear to be replicating CREDA projects.

e) All seminars, workshops, presentations and other information transfer activities should have built into them mechanisms to permit subsequent follow-up with participants. For example, questionnaires such as those handed out at the arena retrofit seminars should be employed. By this means, the impact of CREDA can be better traced and other barriers to replication identified.

5.2.6 Final Evaluation

The final evaluation referred to in the present Agreement should be deferred at least until March 1986. By that time, more quantitative data should be available to permit a useful evaluation of CREDA's impacts.

5.2.7 Barriers to Commercialization

CREDA can identify but not address all the barriers to commercialization of conservation and renewable energy technologies, and several of these barriers (notably financial) are not being adequately addressed by other federal and provincial programs. A demonstration program such as CREDA can only be effective in commercializing technologies for which there is market pull. If the federal government, as part of its policies to increase energy security, wishes to accelerate the commercialization of other new energy technologies, it must develop comprehensive programs to address the barriers which are reducing market pull.

It is recommended that the federal government actively consider carrying out comprehensive market studies to identify the major barriers to commercialization of conservation and renewable energy technologies, and developing additional new policy instruments such as Canercon to address these barriers. The extension of the current program for 30 months provides a sufficient period for policy analysis such that by the time the final evaluation is carried out in 1986, substantive recommendations concerning the termination, continuation or modification of CREDA can be made.

APPENDICES

A MID-TERM EVALUATION OF THE CANADA/NEW BRUNSWICK CONSERVATION AND RENEWABLE ENERGY DEMONSTRATION AGREEMENT

APPENDIX A

TERMS OF REFERENCE

CANADA/NEW BRUNSWICK

CONSERVATION & RENEWABLE ENERGY DEMONSTRATION AGREEMENT

INTERIM EVALUATION

CALL FOR PROPOSALS

(A) Introduction

The Canada/New Brunswick Conservation & Renewable Energy Demonstration Agreement (CREDA), signed January 16, 1980, provided for the expenditure of $11.25 million over four years (to March 31st, 1984) on a program comprising development and demonstration projects in renewable energy resources and energy conservation. The agreement is managed by a federal/provincial Management Committee. The implementing agency is the New Brunswick Energy Secretariat (N.B.E.S.).

This call for proposals is being made to initiate an interim evaluation as required by Clause 9.2 of the agreement. Clause 9.2 actually stipulates that an evaluation be conducted "....within two years of the signing....", but because substantive implementation of the agreement took longer than had originally been expected both parties to the agreement, through the Management Committee, agreed to delay the evaluation.

Outside consultants are being utilized in order to ensure impartiality and objectivity in the evaluation. Further to those ends, while addressing the issues and tasks identified in this document, in their proposals consultants are encouraged to suggest variations on and/or additions to these terms of reference which might improve the evaluation. This document, therefore, should be regarded as a preliminary terms of reference; the final terms of reference will be established in consultation with the successful consultant.

The contract will be let by the New Brunswick Energy Secretariat, in its role as the implementing agency for the Agreement. However, the evaluation is being conducted for and on behalf of the Management Committee for the Agreement, who will approve the selection of the consultant and to whom the final report will be made.

(B) Evaluation Process & Objectives

The main objective of the study is, as required in clause 9.2 of the agreement, "....an impartial evaluation of the effectiveness of the various projects to ensure that they meet the objectives of both

Governments in this Agreement." Toward that end it is envisaged that the evaluation process will be approximately as follows:

1. Identification and description of agreement/program/project objectives.

2. Impacts and effects of programs/projects to date and expected affects after their completion.

3. Objectives achievement - to what extent are objectives being achieved.

4. Analysis of Results to Date - Identify factors contributing to success and/or failure, as appropriate, in meeting objectives. This may include a discussion of the continued relevance of objectives, economic and administrative constraints to project implementation, effect of other programs, etc.

5. Alternatives - Are there more cost effective ways of achieving objectives? Recommendations for agreement/program changes.

(C) Task Outline

Tasks to be undertaken should include, but not necessarily be limited to:

1. Examine program background, rationale and objectives.

2. Review and confirm status of approved projects up to March 31, 1983. Also estimate the disposition of proposals received up to March 31, 1983.

3. Examine current routine for processing submissions from initial receipt to final disposition and project implementation as applicable. Special attention should be given to the evaluation of the strengths and weaknesses of intergovernmental and interdepartmental relationships.

4. Identify complementary or competing programs that appear to significantly impact CREDA.

5. Identify and quantify:

   a) Operational outputs such as:

      - proposals processed
      - turnaround cycle
      - information transfer activities

b) Program output such as:

- financial highlights
- gross energy impact
- jobs created, industrial impact
- public participation, visits, information requests, etc.

c) Program effects:

- commercial and market penetration of key technologies.
- replication activity
- impact on energy security targets
- off oil activity
- national and international marketing efforts, etc.

6. Identify apparent constraints to effective program implementation (controllable and non-controllable).

7. Indicate extent to which program rationale and objectives still appear relevant.

8. Review preliminary findings with the Management Committee.

9. Prepare a summary of findings, conclusions and recommendations related to present and expected program effectiveness and efficiency.

(D) Budget

A maximum of $35,000 is being budgeted for the evaluation. Proposed evaluation costs should not exceed this amount. Consultants may suggest work which would result in costs in excess of $35,000 provided they clearly stipulate the work which would be accomplished for $35,000 or less.

(E) Administrative and Reporting Requirements

The contract will be let by the Energy Secretariat with the approval of the Management Committee. All files, reports and operating documentation of the Agreement from both the New Brunswick Energy Secretariat and the Canada Department of Energy, Mines & Resources, will be made available for review by the consultants. The preparation of any special summary or analytical reports necessary for the evaluation will be the responsibility of the consultant.

In the conduct of the study the consultant will report to the Deputy Minister, Energy Secretariat. Provision will be made for periodic reviews of the evaluation by the Energy Secretariat and/or Management Committee and submitted through the Deputy Minister, N.B.E.S.

(F) Proposal Content

In addition to indicating their proposed approaches and detailed methodologies for fulfilling these terms of reference, plus any variations and/or additions thereto, consultants will include background information on their capabilities and experience in the field of program evaluation. Each proposal should specify the individuals who would work on the study, the application per diem rates and other charges.

(G) Schedule

Proposals should be submitted by April 15, 1983. It is expected that the contract will be awareded by April 25, 1983. The draft report will be expected by June 15,1983 and the final report by June 30, 1983.

(H) Proposal Selection

Proposals will be evaluated mainly on the basis of the experience and capabilities of the consultants on program evaluation, the study approach and methods proposed, and the ability of the consultant to complete the study on schedule. The proposal should present a clear detailed and appropriate methodology which emphasizes program results to date and expected effects and impacts, and the analysis thereof.

Total cost will be considered but only as a factor secondary to proposal quality and the resources being brought to bear on the study in consideration of which per diem rates will be important. Proposals incorporating New Brunswick expertise will be given preference although the need will not be ignored to ensure comparability between this study and studies of similar demonstration agreements in other provinces.

(I) Proposal Submission

Proposals should be submitted by April 15, 1983 to:

Mr. John L. Williamson
Deputy Minister
Energy Secretariat
Province of New Brunswick
P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

APPENDIX B

PROJECT PROFILES

APPENDIX B

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CONSERVER HOUSE

SUBPROGRAM: General Conservation

TECHNOLOGY: Various residential retrofit, conservation and renewable energy technologies

LOCATION: Fredericton

OBJECTIVES: To increase public awareness of conservation and renewable energy technologies, in particular those applicable to the residential sector, through the conservation and renewable energy retrofit of a century-old house and conversion of the house to a public information centre.

TYPE OF DEMONSTRATION: Marketing

FUNDING BREAKDOWN:

New Brunswick	$ 71,588
Canada	286,355
Conservation Council of N.B.	Goods and services in kind.

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

The idea for this project was generated by the Conservation Council of New Brunswick, a non-profit citizen's environmental group. The concept of a demonstration house/information centre was inspired by Ecology House in Toronto (an Ontario CREDA project) and by the development of community energy centres in Sweden. The idea for a project had, in fact, been put to the Energy Secretariat by CCNB before the inception of CREDA.

The first proposal was submitted in February of 1979. It proposed an operating period of one year and a total budget of $56,300; no building had as yet been identified. Energy Secretariat advised CCNB that the proposal would be put on file pending the signing of CREDA, and would be supported by the Secretariat if CCNB could line up a building. CCNB began negotiating with the Department of Supply and Services, and submitted a revised proposal based on a government-owned property at 180 St. John Street, with a one year budget of $91,900.

b. Proposal Assessment

This was the first proposal received by CREDA, and little attention had been given at this stage to defining criteria for proposal assessment. There appears to have been a strong desire to "get the ball rolling" and get projects started; the project appeared to fit within the criteria of the Agreement and was thus approved. EMR reviewers concluded that the retrofit proposal was sound technically but needed augmentation of the information transfer component. (At this time, Energy Secretariat had no personnel capable of assessing the information transfer aspects of proposals and thus Secretariat assessment appeared to have focussed more on technical aspects). Approval in principle was received in August 1980 for three years of funding to a total of $237,666. The first year operating budget was set at $123,865 and a revised proposal was requested.

c. Project Preparation

The request for a revised proposal was the result of EMR concern about information transfer. The approval letter requested expansion and clarification of the section on "workshops and seminars" and inclusion of a "literature distribution activity" to provide the public with access to residential energy literature. The impetus for clarification of information transfer clearly came from EMR.

Final approval was not received until December 1980, and a contract was signed in January of 1981. Considerable time was required to develop the contract format, since this was the first project to be signed. Meanwhile, CCNB had already borrowed money and began construction three months earlier.

d. Project Implementation

Construction

CCNB formed an "Advisory Committee" to provide assistance and technical advice during the construction phase; the committee included government (provincial and municipal), utility, university and other representatives. This appears to have been a method of obtaining volunteer consulting advice, but also served to achieve inter-agency involvement in the project. In some senses this could be viewed as an attempt to involve some elements of the target audience in the project. It was also an attempt to prevent politically-oriented controversy during the implementation of what was acknowledged to be a high profile project.

No major problems were encountered during construction. The CCNB moved into the building before carrying out the retrofit in order to demonstrate to the public that it was possible to retrofit a building while living in it; the ultimate conclusion was that it was possible but not advisable. The major problem for the non-profit organization was cash flow because of the necessity to make capital expenditures from their own resources prior to reimbursement.

Monitoring

The subject of monitoring generated a certain level of controversy between the Energy Secretariat and CCNB. The Energy Secretariat

felt that Conserver House's technical advisor should be an engineer; CCNB felt that ability to communicate with the public was more important, and hired a non-engineer. CCNB wished to carry out only very simple monitoring, and felt that the Energy Secretariat was taking an "over-engineered" approach to monitoring that was not relevant to the needs of the demonstration's non-technical target audience. Budget constraints were also a consideration. Eventually a compromise was reached and a fairly low-cost monitoring system developed. Monitoring has been ongoing since August of 1982.

Reporting

Interim monthly and annual progress reports are produced, and a final report will be produced at the end of the project in March/84. The proponent has found the requirement for monthly progress reports somewhat irksome, although the Secretariat finds these reports to be very valuable.

Information Transfer

Information transfer is central to the whole concept of Conserver House. Seminars, workshops, a library, tours and response to public information requests are techniques employed. Conserver House differs from most of the other CREDA projects in that the final report is not central to information transfer.

The main issue appears to be that of "catchment area". While some 3,000 people visit Conserver House annually the majority appear to be from the Fredericton area. The original EMR review of the proposal noted that outreach was not well addressed. This lack of planning, compounded by funding constraints, has resulted in a weak outreach program. A travelling display was not completed until October of 1982. It was taken to 20 communities outside of Fredericton but generated

very little response, apparently because little groundwork had been done in the communities prior to the visit. Given the high level of CREDA funding in the project, its small catchment area and limited outreach raise questions about how efficient the Conserver House has been in increasing public awareness.

GENERAL OBSERVATIONS:

The project differs from most CREDA projets in that it has more of a marketing than a technical orientation. In some ways it resembles an extension service rather than a demonstration project in that it does not have a defined end (beyond that imposed by external time constraints).

It is interesting that Conserver House personnel noted that "people will not pay for the information we provide". At the moment, it appears unlikely that the service provided by Conserver House will continue after the expiry of CREDA, because no other organization appears to be willing to shoulder the costs involved. The most likely approach appears to be the establishment of some sort of municipal advisory service, but given budgetary constraints, there is considerable doubt that the facility will be continued at all.

It is difficult to assess how effective Conserver House has been in increasing public awareness. On the one hand, it has provided a valuable advisory service for people confused by the conflicting claims of insulation and retrofit companies. On the other hand, its effectiveness appears to have been severely limited by a lack of sufficient funding for information transfer and outreach beyond the Fredericton area.

COMMUTER VANPOOLING

SUBPROGRAM: General Conservation

TECHNOLOGY: Use of vans and mini-buses rather than cars for commuter transportation

LOCATION: Province-wide

OBJECTIVES: To stimulate the formation of commuter vanpools which will ultimately be self-supporting and commercially viable.

TYPE OF DEMONSTRATION: Since the concepts and technologies involved are well proven, this should be regarded as a marketing type demonstration.

FUNDING BREAKDOWN:

New Brunswick	$ 5,400
Canada	21,600

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

The idea for this project was generated by the New Brunswick Department of Transportation (DOT). Several vanpools had been set up prior to CREDA under a federally funded vanpooling program and a number of independent vanpools were known to be operating in the province (some estimates range as high as 50 vanpools in the Bathurst area alone).

b. Proposal Assesment

A proposal for a vanpooling demonstration was submitted in March of 1980. From discussions with Energy Secretariat personnel, it appears that while the proposal was not considered to be exceptional, the concept of vanpooling itself was felt to be sound, and there was some pressure from EMR to approve projects in the transportation sector since this sector accounts for such a large proportion of energy (particularly oil) use. Also, this was one of the earliest proposals to be submitted and there was considerable eagerness to get projects started up.

Reviewers of the proposal at EMR raised a number of questions about the proposal. The rationale for funding it under CREDA was questioned in the light of the existence of another federal demonstration program concentrating specifically on vanpools. The proponent's claim that the proposal was unique was taken to indicate lack of a thorough knowledge of the subject area since a number of other provinces had active vanpool programs. The information plan was judged to be "totally inadequate", and the conclusion was drawn that the proposal was not for a demonstration at all, but rather for a subsidized vanpool program.

Despite these fundamental weaknesses, the project was approved by Management Committee in July 1980. Clearly, proposal assessment was not being taken seriously at this stage in the CREDA program.

c. Project Preparation

Likewise, little attention appears to have been given to project preparation. There was, however, a long delay prior to signing of the contract in September 1981. DOT had already undertaken work on the project, however, by the end of 1980, since the lack of a contract was less of an impediment in an interdepartmental project than it would have been for a private sector proponent.

d. Project Implementation

There was no construction involved in this project. Rather, the first stage of project implementation involved promotion of the program and solicitation of applications. This does not appear to have been well planned or particularly effective. The Energy Secretariat recommended several information transfer activities, but DOT did not act on most of these recommendations. The only recommendation that was followed was the production of a seven panel pamphlet; this was produced for DOT by the Secretariat. Other than that, the principal methods used to generate public response were the writing of letters to town councils and businesses with more than 25 employees, a one-time advertisement in newspapers, and a smattering of television and radio interviews. The approach taken placed a heavy onus on the public.

In response to enquiries generated from these activities, vanpooling information kits were sent out. The proponent appears to have ignored concerns expressed by the newly hired CREDA information officer with respect to the attractiveness (and hence ultimate effectiveness) of the brochures, kits and posters. The Secretariat advised professional design and printing of these materials, but this advice was ignored. A rather unattractive poster was produced, and fairly cumbersome information packages were sent out. Nine months later, no applications had been received.

The proponent interpreted this lack of response as indicating that the level of subsidy offered was too low, and approached the Secretariat with a request to virtually double the subsidy offered. This change was approved by Management Committee. Another newspaper advertisement was run by the Energy Secretariat; this generated 34 enquiries.

To date, only 3 vanpools have been funded under the project, and one of these was already in existence before the project began. A combination of poor promotion and excessive regulation appears to underlie the poor response. Many of those prospective vanpool operators who did enquire appear to have been "turned off" by the insurance, taxation, reporting and other requirements, and by restrictions on fares that passengers could be charged. It appears to have been considered easier and more profitable to operate a private vanpool than to get involved in the "red tape" and obligations associated with the program.

GENERAL OBSERVATIONS:

This project appears to have been poorly planned. One must question why it was approved, when provincial and especially federal reviewers pointed out serious conceptual and operational flaws in the proposal. However, the project was valuable in pinpointing institutional and legal barriers to the spread of regulated vanpooling.

WASTE HEAT AQUACULTURE

SUBPROGRAM: Heat Recovery

TECHNOLOGY: Use of power plant spent cooling water in salmon and trout hatchery

LOCATION: Newcastle Creek

OBJECTIVES: To test the concept, and to resolve the technical problems involved in transport of waste heat from source to use.

TYPE OF DEMONSTRATION: Technical

FUNDING BREAKDOWN:

New Brunswick	$ 22,000
Canada	$ 88,000
Canadian Electrical Association	$ 60,100
N.B. Electric Power Commission	$ 41,000
N.B. Department of Natural Resources	$ 54,000
N.B. Coal	$ 18,000
Canada Fisheries and Oceans	$ 8,000
N.B. Wildlife Federation	$ 68,100

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

This project was initiated by a fisheries biologist in the N.B. Department of Natural Resources. The department had been carrying out hatchery projects in the region around the Grand Lake power plant

where strip mining of coal had resulted in the formation of a number of small bodies of groundwater with ideal characteristics for raising fish. However, the economic viability of the projects had been hampered by the poor winter growth of the fish. The proximity of the power plant inspired the idea of using heated water in the raceways, and discussions ensued with the N.B. Electrical Power Commission (N.B. Power). A newspaper article on the signing of CREDA prompted an enquiry and then submission of a proposal in March 1980 by the Department of Natural Resources.

b. **Proposal Assessment**

This was one of the earliest proposals received, and proposal assessment was thus not overly rigorous. However, the proposal appeared to be well thought out, and included a detailed information transfer plan including reports, brochures, preparation of papers for fisheries publications and conferences, production of a film, media coverage and tours. Approval from Management Committee was obtained in December of 1980.

c. **Project Preparation**

This project is remarkable for the wide variety of other agencies involved in funding. This represents a strong attempt to involve the target audience from the earliest stages. The credit for this rests with the proponent.

Few changes to the original proposal appear to have been made during the project preparation stage. The contract was signed in March 1981 -- final design and construction had already been undertaken and completed.

An indication of limited attention to project preparation is the fact that no funds were budgetted in the contract for information transfer and final report preparation, although completion dates for both these tasks were given.

d. Project Implementation

Construction

No problems appear to have been encountered during construction. The site was inspected twice during the construction period by Energy Secretariat personnel.

Monitoring

Monitoring was carried out between February/81 and February/82. The need for temperature and flow alarms was revealed by problems with thermal kill.

Reporting

Interim progress reports were submitted and a final report prepared in April 1982. After review by the Energy Secretariat, it was returned to the proponent for revisions, because the Secretariat felt it concentrated too much on fish and not enough on energy.

Information Transfer

The involvement in the project of a number of agencies representing different target groups has been a positive factor in information transfer.

GENERAL OBSERVATIONS

This project appears to have been a successful technical demonstration, and has also generated a fair amount of public interest. The demonstration's success subsequently led to a commercial size marketing demonstration (CREDA project 2020— Cogeneration and Aquaculture) and to the formation of Grand Lake Resources to manage aquaculture and greenhouse activities at the Grand Lake power station.

This demonstration, and others involving use of power plant waste heat, raise a number of institutional issues which do not appear to have been addressed in any depth. The relationship between producers and consumers of waste heat will need to be better defined if commercial aquaculture, greenhouse, etc. operations are to be based on the use of waste heat. The importance of establishing clear channels of communication was revealed in this project when power plant personnel neglected to inform the hatchery that condenser tubes were being cleaned with sulphuric acid, and the resulting toxic effluent killed one-quarter of the fish in the hatchery.

Likewise, demonstrations to date have avoided addressing the question of pricing of waste heat. Current N.B. Power policy is to contract to provide waste heat free of charge to operations which it judges appropriate and viable. However, if replication of projects such as this increases the demand for waste heat, it will obtain a value, and pricing policies will be needed. To date, the heat recovery subprogram has not addressed these issues in the same way the wood subprogram has addressed similar problems related to the costing and pricing of wood residues.

WOOD CHIP BURNER

SUBPROGRAM: Wood

TECHNOLOGY: Wood chip boiler, storage bin, augers and piping.

LOCATION: Madawaska County (St. Hillaire Correctional Centre)

OBJECTIVES: To demonstrate the use of wood chips as a replacement for oil in providing the space heating and hot water requirements of an institutional user.

TYPE OF DEMONSTRATION: This has some of the aspects of a technical demonstration (i.e. low profile and attitude of healthy skepticism), and some characteristics of a marketing demonstration (i.e. full operational environment). It appears to have been conducted more as a technical demo.

FUNDING BREAKDOWN:

New Brunswick	$ 34,000
Canada	$ 136,000
N.B. Department of Supply and Services	$ 99,000

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

The idea for this project was generated by the Department of Supply and Services prior to the signing of CREDA. The original motivation for the project was based as much on the employment of inmates at the correctional centre (i.e. harvesting and chipping wood) as on the desire to reduce energy costs.

The original proposal submitted in June of 1980 proposed installing a wood chip burner at the newly constructed correctional facility in Saint John. The reasoning was that if it proved to be successful, a similar unit could be installed in the institution being constructed in Edmunston.

b. Proposal Assessment

The main concerns during this stage revolved around assurance of wood chip supply. These concerns ultimately prompted the Secretariat's request that the project be carried out in Madawaska County rather than Saint John. Management Committee approval was ultimately obtained in July of 1981.

c. Project Preparation

Few changes appear to have been made at this stage. Supply and Services wanted to burn sawdust at the Edmunston facility because it was considerably cheaper than wood chips, but the Energy Secretariat insisted that the basis for project approval had been the use of wood chips and that wood chips must therefore be used rather than sawdust. This condition resulted from concern on the part of the Secretariat that sawdust will be available only on a short-term basis.

The contract drawn up listed eight tasks in the Statement of Work including monitoring and information transfer, but did not identify specific budgets for each task.

d. Project Implementation

Construction

Delays encountered in the tendering of the foundation resulted in further delays when construction had to be postponed because of

freeze-up. Construction was ultimately completed in December of 1982.

Monitoring

Monitoring has been somewhat of a bone of contention between the proponent and the Secretariat. At the time the contract was signed, the Secretariat had not yet clarified its approach to monitoring and the responsibility for this aspect of the project was thus left with the proponent. The main interest of the proponent was cost, and the only monitoring of interest was comparison of pre-wood fuel bills with post-wood fuel bills. There was no mention in the proposal of monitoring.

As the Energy Secretariat hired monitoring engineers and developed a more systematic approach to this phase of the project cycle, the proponent was requested to submit a monitoring plan. To date, the two agencies have yet to agree on the issue, although the Secretariat hopes to have a monitoring system in place by August of this year. Because of these delays, the project cannot be monitored to the extent the Secretariat would wish before the end of the Agreement.

Reporting

The original deadline of the final report is August 1983, but this will not be met. If full monitoring data are to be included, the final report could not be received before expiry of the Agreement.

Information Transfer

Information transfer to date has been largely informal. Several other provincial government departments have shown interest in the project; the Department of Education is installing a wood chip burner at Belleisle School with CREDA assistance , and the Department of Health

has put in a proposal to a similar unit to be installed in the new Edmunston Hospital.

The proponent plans to put together a slide show for presentation at interdepartmental meetings, etc. However, a low profile has deliberately been maintained to date because of a desire to gain more operating experience.

GENERAL OBSERVATIONS

Technically, this demonstration appears to have been very successful. The unit performs reliably unattended, and the proponent's initial doubts have been allayed to the extent that the oil backup unit is no longer kept on standby. The operating costs of heating with wood are working out at about 20 to 25% those of using oil.

The main issue associated with the project appears to be a difference in perception between the proponent and the Secretariat as to the information needs of the target audience (and hence the type of monitoring required). Greater attention to project preparation would have been desirable to resolve these questions at an early stage.

SUPER ENERGY EFFICIENT RESIDENCES

SUBPROGRAM: Solar

TECHNOLOGY: Two identical 2500 square foot residences with 4 senior citizen's apartments in each. One building with super-insulation, triple glazing, air solar collectors and rock storage, and air-to-air heat exchangers. Other building identical but without solar system.

LOCATION: Sackville

OBJECTIVES: To evaluate and demonstrate the additional costs and benefits of active solar heating versus simple super-insulation techniques.

TYPE OF DEMONSTRATION: This is basically a technical demonstration, but in an operational, full-scale environment.

FUNDING BREAKDOWN:

New Brunswick	$ 12,513
Canada	$ 50,051
United Church Home for Senior Citizens	$ 278,734
United Church of Canada	$ 29,043

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

The idea for this project was generated by Parsons Construction Co. Ltd. of Moncton, an engineering and construction company which had already carried out several solar energy projects. Parsons had already constructed six senior citizens' cottages for the United Church of Canada, and after reading of CREDA in a newspaper article and

obtaining more information from the Energy Secretariat, submitted a proposal for two solar heated, super energy efficient (SEE) cottages in June of 1980.

b. Proposal Assessment

Proposal assessment at the Energy Secretariat appears to have concentrated on technical concerns which were satisfied after additional information was provided by the proponent. At the suggestion of the Secretariat, Parsons revised the proposal to encompass the building of only one solar SEE house, with the other house being a SEE control.

Little weight was given to identifying the target market or to assessing the potential for replication given the estimated payback of 17.2 years cited in the proposal (according to the proponent the Secretariat claimed to have information which indicated the payback would be shorter). The revised proposal received in July 1980 was sent to EMR for review. EMR agreed to support it and Management Committee approved the project in August 1980.

d. Project Implementation

Construction

Construction began in October 1980, four months before the signing of the contract, and ended in May 1981. No major problems were encountered.

Monitoring

Monitoring has been a major problem in this project. Parsons subcontracted the monitoring component of the project to an employee of Mount Allison University who devised an extremely sophisticated and complex monitoring plan. Parsons received virtually no guidance from the Secretariat in monitoring and agreed to the development of a system which he now feels is much too comprehensive and which monitors more variables than is necessary.

The person responsible for developing the monitoring systems has only now completed his work, with the result that monitoring has just begun, two years after construction was completed. The delay has proved frustrating for the proponent because electricity bills for the cottages indicate that the solar heated building is consuming more electricity than the SEE control, but without data from monitoring it has been difficult to confirm exactly why this is so. The data which will become available during the next year should answer these questions.

It is likely that the problem experienced in this project would not be encountered in projects developed now that the Energy Secretariat has a full time Energy Performance Monitoring Engineer on staff. Indeed, they serve to illustrate how far the Secretariat has progressed in its management of this aspect of project implementation.

Reporting

A final report was submitted in February of 1983 and is currently under review by the Secretariat. When further data are produced, the Secretariat will incorporate them into the report.

Information Transfer

Little attention was given to information transfer at the project preparation phase and because of the lack of confirmed results, there appears to have been little information transfer. However, the proponent did prepare, on his own initiative, a detailed and documented photo summary of the project construction, and an official opening and an open house were held.

GENERAL OBSERVATIONS

This project was one of a number of solar projects carried out early in the CREDA program in New Brunswick. The problems that ensued with monitoring have delayed results and completion of the final report.

However, the project has been helpful in that it has confirmed the inappropriateness of active solar space heating in climates such as New Brunswick. A complaint of the proponent was that all the technical literature he had read on solar emphasized the positive effects and did not deal with the problems (the literature upon which the Secretariat relied evidently fell into this category judging by the optimism about paybacks). When the United Church consulted Parsons about installing active solar space heating in planned new buildings he advised against it based on the experience gained through this project. In some ways, "failure" may be as useful as success in providing information, and this has thus been a useful demonstration project.

SOLAR HOT WATER HEATING

SUBPROGRAM: Solar

TECHNOLOGY: Solar assisted domestic hot water.

LOCATION: Shediac

OBJECTIVES: To demonstrate large scale solar assisted water heating.

TYPE OF DEMONSTRATION: The emphasis on large scale and operational environment point to this project being a marketing demonstration. However, the low profile and technical uncertainties are more characteristic of a technical demonstration, and the project has been conducted mainly as a technical demonstration.

FUNDING BREAKDOWN:		
	New Brunswick	$ 39,440
	Canada	$ 157,760
	Villa Providence	$ 49,300

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

The idea for this project was generated by the Chairman of the Board of Villa Providence (a nursing home) who had a personal interest in solar technology. After reading about CREDA in a newspaper article, he requested Villa Providence administrators to consult with the Energy Secretariat. Subsequent to these discussions and discussions with Petro Sun in Montreal, a detailed proposal was submitted in September of 1980.

b. **Proposal Assessment**

The main concern of the Energy Secretariat in assessing the proposal appeared to be the level of funding requested, which was in excess of $200,000. Identifying the target audience and evaluating whether that audience would find acceptable the payback of 13 years projected in the proposal does not appear to have been a major priority.

The proposal was also reviewed by the provincial Community Improvement Council (CIC), who were also concerned by the level of support being requested, and by whether the directors of Villa Providence would accept the responsibility for cost overruns. CIC also wondered if New Brunswick consultants had the expertise to undertake the detailed design work.

Despite these concerns, the project was approved by Management Committee in December of 1980, for $221,500. However, in the letter of approval sent to Villa Providence in January 81, the funding level was set at $197,200, 80% of the total estimated project cost of $246,500.

c. **Project Preparation**

The contract for the project was signed March 31/81. Unlike earlier contracts, the Statement of Work included budgetted amounts for information transfer and final reporting as well as construction and monitoring activities. These amounts appear to have been arrived at, however, by estimating a straight percentage of total project costs rather than by developing costs associated with a specific information transfer plan.

Contingency funds of $20,000 were included in the contract budget because the Energy Secretariat had apparently not yet decided whether a separate monitoring building would be required.

d. Project Implementation

Construction

A number of delays were experienced during this phase, apparently because of equipment deliveries and the inexperience of the proponents with the technology. Considerable problems were encountered in getting PetroSun to verify and help solve operational problems, as PetroSun regarded such on-going consulting work as being above and beyond what they had contracted to do. Villa Providence had no engineer on site, and in hindsight feel that things would have proceeded much more smoothly if a local company had been involved; ultimately a local consulting company was hired. The proponent appears to have occasionally been somewhat overwhelmed by a plethora of contradictory advice from the consultants involved but the situation has been resolved through liaison by the Secretariat between the various parties.

As a result of these numerous delays the construction phase was not finished until May of this year, more than two years after the construction deadline indicated in the contract.

Monitoring

An additional $10,000 was allocated in October/82 for monitoring. The contract budget was inadequate in this area. Monitoring has not yet begun because of the delays in installation and commissioning. One advantage of these delays was that now that monitoring is due to start, the Secretariat is well organized in this regard. However, the current schedule calls for monitoring between September/83 and September/84, which clearly cannot be done in full under the terms of the present Agreement.

Reporting

If the final report is not written before the monitoring ends, this phase of the project will also clearly extend beyond the limits of the Agreement.

Information Transfer

Information transfer to date has been informal, and technical problems have necessitated the adoption of a lower profile. An information transfer plan does not appear to have been developed. Given current scheduling, it seems unlikely that much of the information transfer required can take place within the Agreement.

GENERAL OBSERVATIONS

This project suffered mainly from the technical inexperience of the proponent, which has been largely overcome. However, more fundamental questions might also be asked about the potential replicability of the project given the long paybacks involved.

HEAT RECOVERY (JIFFY PRODUCTS)

SUBPROGRAM: Heat Recovery

TECHNOLOGY: "Heat Wheel" to recover heat from peat product dryers.

LOCATION: Shippigan

OBJECTIVES: To demonstrate the application of heat wheel technology in a demanding industrial environment.

TYPE OF DEMONSTRATION: This has most of the elements of a technical demonstration.

FUNDING BREAKDOWN:		
	New Brunswick	$ 9,672
	Canada	$ 38,688
	Jiffy Products Ltd.	$ 42,940

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

This project was initiated by Jiffy Products Ltd., a company manufacturing dried "peat pots" for the horticultural market. The manufacture of the pots is a highly energy-intensive process, especially in the drying stages. Jiffy is therefore very conscious of energy costs, and following an "Energy Bus" audit in 1979 was investigating options for heat recovery. Subsequent to discussions with the Energy Secretariat, a proposal was submitted in August 1980. The proposal was prepared for Jiffy by ADI Ltd.

b. **Proposal Assessment**

The original proposal proposed three demonstration projects: energy recovery from plant exhausts, roof retrofit, and use of fuel peat to replace propane as the fuel source for the peat dryers. The heat recovery proposal mentioned that it was not clear that a heat wheel was the most suitable heat recovery method for the high humidity environment involved. Paybacks were estimated at 5 years for the heat recovery, 15 years for the roof retrofit and 13 years for the peat burner. The proposal contained no mention of either monitoring or information transfer.

The Energy Secretariat responded positively to the heat recovery and peat burning components of the proposal but felt the payback on the roof retrofit was too long and that the approach proposed was well proven. The payback on the peat burner was also long, but there appears to have been considerable interest with the concept. The CIC, however, in its review, was concerned by the apparent technical uncertainties surrounding the application of the heat wheel and felt that a full scale demonstration could be premature. CIC also raised questions concerning the payback period for the peat fired furnace and the assurance of a peat supply.

Management Committee apparently resolved these questions to its satisfaction, and approved the heat recovery ($43,000) and peat burner ($466,000) projects in December/80.

c. **Project Preparation**

In March/81, Management Committee decided to separate the heat recovery and peat burner into two projects. The heat recovery project would be prepared immediately, but the peat project would be delayed pending resolution of a number of federal questions about its relevance and practicality.

The contract for heat recovery project was signed in July/81. It included funds of $4,000 for information transfer, but none for final report preparation. The information transfer funds were considerably reduced from the $7,000 specified in the original Management Committee approval.

d. Project Implementation

Construction

Construction was delayed for a number of months, apparently because of difficulties with the consulting company involved. Jiffy was not satisfied with the quality of the design and engineering work done, and eventually took over this aspect of the project themselves.

Problems were also encountered with the heat wheel. The first unit supplied was defective, and was returned to the manufacturer. The second wheel supplied was also defective, so Jiffy changed suppliers. The unit was not actually installed until December of 1982, more than a year after the contract deadline.

Monitoring

Some $3,000 were allocated in the contract for performance monitoring. Once a monitoring plan was developed by Jiffy in September 1982, it became clear that this was insufficient and in March/83 funds were reallocated from capital budgets. Monitoring is expected to start in September/83, and will focus primarily on the efficiency of the heat wheel.

Reporting

Monitoring is expected to require only one month (although Jiffy may continue to monitor for its own use) and a final report is expected by the end of 1983.

Information Transfer

Little attention appears to have been given to information transfer aside from the standard press release, project summary and signage.

GENERAL OBSERVATIONS

The major problems of this project have been related to technical uncertainties and inexperience. There was considerable doubt even at the proposal stage as to whether the heat wheel concept was appropriate to the high humidity and high dust levels characteristic of Jiffy's operations. It appears that a smaller scale pilot test should have been done to test the concept prior to a full scale demonstration.

The proponent is of the opinion that consultants with more experience in heat recovery would not have recommended a heat wheel for this application, but that most consultants in New Brunswick have little experience with energy conservation technologies. (A similar problem arose in the Villa Providence project because of the lack of experienced solar consultants in New Brunswick). It should be noted that this is now likely to be less of a problem because of the consulting experience that has developed in New Brunswick as a result of involvement in CREDA projects.

DUCTED PROPULSION SYSTEM

SUBPROGRAM: Retrofit

TECHNOLOGY: Ducted propulsion system for use in wooden fishing boat.

LOCATION: Caraquet

OBJECTIVES: To demonstrate the adaptation of a ducted propulsion system to a small fishing boat and the resultant savings in conventional fuel oil.

TYPE OF DEMONSTRATION: Marketing. While this is a new application for ducted propulsion systems in the region, the technology is well proven and has been applied for a number of years in larger vessels in other areas. The scale of the demonstration is operational, the attitude is one of optimistic assurance and the target market has been well exposed to the demonstration.

FUNDING BREAKDOWN:

New Brunswick	$ 2,304
Canada	$ 9,216
Mr. P. Legere	$ 2,688
Fisheries and Oceans	$ 11,000

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

This project evolved out of a project of the federal department of Fisheries and Oceans in which equipment for the on-board cooking and freezing of shrimps was installed on the shrimp boat of

Mr. Pamphile Legere. The equipment increased the boat's fuel consumption and ways were sought to increase fuel efficiency. Fisheries and Oceans suggested installation of a Kort nozzle (a particular brand of ducted propulsion system) but would only pay part of the costs. Legere consulted with the local provincial fisheries representative, Herman Branch, who had heard of CREDA through a brochure. Since Legere did not feel capable of preparing a proposal, Branch prepared it for him as a favour. The proposal was submitted in January/81.

b. Proposal Assessment

The Energy Secretariat rapidly recommended the proposal for approval and sent it to EMR, CIC and Fisheries and Oceans for review. The main concern was raised by the Secretariat's information officer who found the proposal's information transfer and reporting provisions to be weak. Management Committee approval was obtained in July/81.

c. Project Preparation

Funds for information transfer ($1,000) were built into the project at this stage. The target audience was identified as other Gulf of St. Lawrence fishermen.

d. Project Implementation

Construction

No problems were encountered in installing the system, which was a packaged system manufactured in Halifax.

Monitoring

Monitoring equipment was provided by Fisheries and Oceans. Speed, pull, engine rpm, fuel consumption were all monitored. Results indicate fuel savings of 18 to 25%.

Reporting

A final report on the project was submitted in April/83 and is under review by the Secretariat. It is expected that a rewrite will be done by a professional writer.

Information Transfer

Information transfer has been largely informal because of the nature of the principal target audience. Branch is in regular contact with all the Gulf fishermen and relies heavily on "word of mouth" information transfer. Interest appears to be high among the other fishermen but replication has apparently been limited by financial constraints.

Branch has also given thought to giving technical presentations to associations such as the Society of Naval Architects and Marine Engineers, thereby reaching audiences in other provinces, but has been hampered by time constraints since his involvement in the project is on a volunteer basis.

A number of articles have been published in trade magazines based on information supplied by the Secretariat.

GENERAL OBSERVATIONS

This has been a trouble-free low investment project. Information transfer to the immediate target audience has been good. New Brunswick fishermen are clearly interested in replicating, but only if funding assistance is provided by some agency such as the provincial or federal fisheries departments.

HOT RECYCLING OF ASPHALT

SUBPROGRAM: General Conservation

TECHNOLOGY: Hot recycling of reclaimed asphalt pavement.

LOCATION: Ludlow

OBJECTIVES: To demonstrate conservation of liquid asphalt and gravel and resultant cost savings by the hot recycling of reclaimed asphalt pavement.

TYPE OF DEMONSTRATION: Marketing. Off-the-shelf equipment is being used in a full scale operational environment.

FUNDING BREAKDOWN:

New Brunswick	$ 15,000
Canada	$ 60,000
Eastern Paving Ltd.	$ 46,460

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

This project was generated by Eastern Paving Ltd. The company had been interested for some time in asphalt recycling because of positive American experience with the concept. The provincial Department of Transportation (DOT) was also interested in the concept, and in 1981 called for tenders on a recycling job on Route #8. Eastern Paving was the successful bidder, and had thus already committed to purchasing recycling equipment before hearing of CREDA. However, CREDA assistance would permit a more extensive modification of their equipment than what the small experimental DOT job required, with the result that the company could become seriously involved in recycling.

Without assistance Eastern Paving would have "played it safe" and only purchased the minimum equipment required to do the DOT job.

b. **Proposal Assessment**

A proposal was submitted in February of 1981, and passed quite quickly through both provincial and federal review processes. The only concern expressed was by the Energy Secretariat information officer, who was concerned that the level of funding proposed for information transfer was too low. Management Committee approval was obtained in April/81.

c. **Project Preparation**

The original proposal had asked for a CREDA contribution of $97,170, or 80% of total project funding, on the grounds that it was to be an important high profile demonstration. Management Committee reduced this to $70,000 plus an amount for information transfer, which the Secretariat set at $5,000.

Project preparation was delayed because of concerns expressed by DOT regarding the awarding of extra funding to Eastern Paving after the recycling contract had been awarded. An explanation from the Secretariat that the funding had been awarded because the project offered a good opportunity to demonstrate hot recycling and disseminate information on the process appears to have satisfied these concerns.

The project contract was signed in September of 1981. No funds were budgetted for performance monitoring, although this was listed as a task in the statement of work.

d. Project Implementation

Construction

Installation of a Standard Havens recycle package proceeded without difficulty, as did the reclamation, recycling and repaving work.

Monitoring

Monitoring consisted basically of measuring consumption of virgin aggregate, asphalt cement and furnace oil and comparing it with consumption for similar, non-recycling projects; aggregate and asphalt savings were in the neighbourhood of 50%, while oil savings amounted to about 8%.

Reporting

Reporting caused some difficulties because this was one of the earliest projects to produce a final report. The proponents had little experience in report-writing, and the Energy Secretariat had not yet settled on a standardized format and set of guidelines for final reports. The final report in many ways resembled a promotional brochure. The Secretariat has contracted to have the report rewritten by a professional writer to conform to the final report format which was drawn up subsequent to this project.

Information Transfer

Information transfer on this project appears to have been less than what might have been expected in a marketing type of demonstration. However, a number of New Brunswick and Nova Scotia paving contractors have toured the site, and an informal seminar was held for

municipal representatives. Distribution by the Secretariat of project summaries resulted in enquiries from as far away as Victoria, B.C.

The final report for this project is now being printed and an extensive mailing list is being developed. Copies of the report will be sent to all paving firms in New Brunswick, all provincial and territorial departments of highways, all provincial road builders associations, the federal Department of Transport, several municipalities and organizations such as the Roads and Transportation Association of Canada.

A systematic attempt was not made, however, to involve all members of the target audience of paving companies and government departments involved with road maintenance. The proponent feels that the Secretariat was not yet sufficiently organized and staffed at the time this project took place.

GENERAL OBSERVATIONS

This appears to have been a fairly successful project in that it proceeded smoothly, and several independently funded replications have taken place (e.g. MacDonald Paving in Moncton and Aberdeen Paving in Nova Scotia among others).

The complications encountered during final report preparation serve to illustrate that the Energy Secretariat should expect to have to play an active role in final report preparation, especially when project proponents have little experience with report writing. Given the large number of final reports to be submitted in the near future, the need to plan and budget for report reworking is clear, and the Secretariat has undertaken these tasks.

FUEL WOOD CHIP HARVESTING

SUBPROGRAM: Wood

TECHNOLOGY: Harvesting, production and distribution of wood chips.

LOCATION: Fredericton

OBJECTIVES: To demonstrate several methods of producing, drying and distributing forest biomass as heating chips, and to evaluate the cost and applicability of wood chips for residential use.

TYPE OF DEMONSTRATION: This is primarily a technical demonstration.

FUNDING BREAKDOWN:

New Brunswick	$ 45,000
Canada	$ 180,000
University of New Brunswick	$ 45,450

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

This project evolved from work already being done at the University of New Brunswick on residential wood chip combustion devices. (This work was funded by the Energy Secretariat prior to CREDA). Once a combustion device had been developed questions about fuel supply arose. The absence of an infrastructure for the supply of wood chips was seen as a major barrier to wood chip combustion technology.

The researchers involved state that they would have proceeded with their investigations had CREDA funding not been available, but that the

work would have had to rely much more on modelling and less on real data. A proposal to CREDA was drafted in late 1979 and submitted in January of 1980.

b. **Proposal Assessment**

The proposal assessment process was lengthy. The Energy Secretariat requested a more detailed analysis of the economics involved, and a revised proposal incorporating this information was submitted in June/80. More revisions were then requested to integrate the proposed work with other New Brunswick particulate fuel projects. A revised proposal incorporating these considerations was submitted in December of 1980.

A concern of Management Committee was that the project contain a strong information transfer plan. A Steering Committee composed of representatives of the Forest Extension Service and the Federation of Woodlot Owners was recommended, but this idea does not appear to have been pursued. This is unfortunate, as the suggestion represented a rare example of Management Committee's attempting to involve the target audience in the early stages of a project.

Management Committee approved the project in principle in April of 1981. Final approval was deferred pending the hiring of a Wood Energy Program Manager, and was conditional on the UNB project manager having a formal reporting relationship with the Wood Energy Program Manager. Because further delays would be involved while the Program Manager was hired, and the proposed project required 3 years to complete, the UNB researchers were given written permission from the Secretariat to proceed with work outlined in their proposal "on the basis that all work completed as per the proposal will be paid until such time as a detailed contract is signed". Final Management Committee approval was obtained in January of 1982.

c. **Project Preparation**

A number of changes to the budget were made during this phase -- delays had resulted in inflation of the capital costs, and the Secretariat increased the amount of money that had been allocated to final report preparation. Few other changes were made, as there was considerable faith in the proponents' ability to manage the project and the major changes had been made prior to approval.

d. **Project Implementation**

Construction

Work on the project began in May of 1981 with silvicultural and harvesting exercises. The bulk of the activity in harvesting and processing however, took place in the spring and summer of 1982 (work has tended to be carried out largely in the summer because of University schedules as well as weather considerations). The final work on chip drying, screening and shipping will be carried out this year -- the construction of a chip storage facility is virtually complete. To date, work appears to have proceeded smoothly.

Monitoring

Some differences of opinion between the Secretariat and the proponents developed over the subject of monitoring early in the project. The proponents felt that the Secretariat's requirements for monitoring were too sophisticated for the needs of this project. However, with the hiring of a Performance Monitoring Engineer the situation improved and the proponents' monitoring plan was approved. Most of the data from monitoring should be gathered in time for inclusion in the final report, due December/83, although the Secretariat would like to see monitoring continue until March/84.

Reporting

The proponents expressed some concern about the format required for final reports. They perceive the main target audience as being primarily rural businesses (woodlots, sawmills) lacking a highly technical orientation. As a result, they plan to write a fairly simple final report and document the technical aspects in ancillary papers. A number of discussions have been held between the Secretariat and the proponents on the subject of the final report, and a draft should be submitted by August 1983.

Information Transfer

There appears to have been little planning for information transfer beyond the press release (which was only issued in February of 1983 due to an 8 month delay at EMR), signs, and summaries. The proponents themselves appear to have a fairly clear idea of who the target audience is because of their ongoing work in this field, but little appears to have been done to involve that audience during the demonstration. The UNB researchers are wary of generating excessive public enthusiasm about wood chip heating before more of the results of various ongoing projects are in. The cautious approach taken appears to be appropriate to a technical demonstration.

The proponents expressed concern, however, that there appear to be few formal mechanisms for the transfer of unbiased technical and economic information on wood chip heating to potential users. Most information is currently supplied by equipment manufacturers interested in promoting their own particular devices (e.g. stokers or furnaces). There appears to be a need for training programs, short courses, or other means of providing practical knowledge and experience that cannot be obtained by reading a final report or attending a one-day seminar.

GENERAL OBSERVATIONS

A considerable amount of care appears to have gone into the planning and implementation of this project, and it has been well managed. The role of the Secretariat is by definition less critical when experienced and sophisticated proponents are involved.

Preliminary project results indicate, according to the proponents, that it is unlikely that a viable commercial small scale wood chip fuel supply business could be set up in the near future in New Brunswick, but these conclusions may be altered once final data have been produced and developed. However, there appears to be considerable potential for the establishment of such businesses as profitable sidelines to related businesses (e.g. sawmills and small wood lot owners). Future information transfer should therefore be carefully tailored to this particular audience.

WOOD CHIP BURNER (BROOKDALE NURSERIES)

SUBPROGRAM: Wood

TECHNOLOGY: Automatically-fed wood chip combustion equipment

LOCATION: Newcastle

OBJECTIVES: To demonstrate the application of automatic wood chip burning technology to commercial greenhouse heating.

TYPE OF DEMONSTRATION: This project has a number of the characteristics of a marketing demonstration (full-scale, operational environment, fairly high profile), but also involved a fair degree of technical innovation.

FUNDING BREAKDOWN:

New Brunswick	$ 11,655
Canada	$ 46,618
Brookdale Nurseries	$ 38,848

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

The project was generated by the proponent, Lloyd Brown, who had been using a manually-fed, chunkwood system to heat his greenhouse operation since 1978. Operating (labour) costs of the manual system were high and the efficiency of burning lower because of inconsistent fuel feed rates. Brown first approached the Technology Transfer Branch of the provincial Department of Agriculture with a proposal to improve the system by designing and building an automatic chip feeding and combustion system. Agriculture considered the project to be one of

testing of a prototype rather than technology transfer, and referred Brown to CREDA.

b. **Proposal Assessment**

After initial discussions, the Energy Secretariat requested that Brown review his plans with Professor Marc Schneider of UNB. Schneider reviewed the plans, visited Brookdale, and advised the Secretariat that Brookdale would be an excellent site for a demonstration because the physical plant was already in place, the proponent was enthusiastic and experienced with heating technology, and machine shop facilities were available on site. Schneider recommended, however, that engineering assistance be provided for the design of the chip burner itself.

A formal proposal was submitted in May/81. The Department of Agriculture expressed its support for the project because of its potential to help greenhouse operators reduce energy costs, increases in which had severely decreased the viability of the industry. However, Agriculture favoured retrofitting of existing boilers rather than the design of new systems, on the grounds that the costs would be lower and thus the potential for replication higher.

The original proposal requested 80% of the total project costs of $122,121. Management Committee approved the project in principle in June/81 to 50%. Brookdale then requested 60%, which the Secretariat argued was acceptable given the poor financial situation of the industry. EMR questioned the heavy subsidy of financially shaky proponents, but in August/81 approved the project at 60% funding.

While the poor financial situation of the New Brunswick greenhouse industry was cited throughout the proposal assessment stage as justification for the project, little attention appears to have been given to the impact of this on the potential for replication.

c. **Project Preparation**

Few changes were made in this phase to the original proposal, which was well prepared and contained a detailed information transfer plan. (Monitoring requirements, however, do not appear to have been as clearly spelled out).

The contract was signed in November/81.

d. **Project Implementation**

Construction

No major problems were encountered during design or construction, which was completed in March/82. A seminar was held the same month.

Monitoring

Monitoring has been a problem in this project. The Secretariat apparently did not clearly spell out its requirements during the project preparation stage, with the result that the proponent and the Secretariat had very different ideas about what was required. The proponent proceeded with his simple monitoring of chip weights and flowrates, but monitoring to the standards required by the Secretariat did not begin until May/83, after additional funds were allocated and a consultant hired to develop and implement the monitoring plan.

These delays have extended the period projected for monitoring beyond the time frame of the current Agreement.

Reporting

The final report has not yet been prepared. The proponent appeared in discussions to be somewhat confused as to what exactly was required of him but showed little inclination to consult the Secretariat; rather, he apparently intends to write up a draft and "hope for the best". Reporting is viewed as a clean-up matter.

The project appears likely to encounter similar problems with this phase as were encountered in monitoring, because the proponent assigns little priority to the activity and is not skilled in the area. This illustrates the need for Energy Secretariat involvement and control in these areas, particularly for projects involving private sector proponents.

Information Transfer

Information transfer received considerable attention in the planning stages. A seminar was held immediately after construction was completed, which was attended by 62 people, including at least 14 greenhouse operators. A questionnaire was distributed and most attendees indicated that they found the seminar useful.

Considerable informal information transfer has also taken place, as the proponent has been cooperative in providing tours of the facility. Representatives from a number of small industries have toured the project, and at least one other greenhouse operator (Royal Gardens) is interested in replicating the project. A seven minute video tape produced by the Department of Agriculture has been aired several times on television.

GENERAL OBSERVATIONS

Early problems encountered in this project were the result of reliance for monitoring and information transfer being placed on a proponent who had neither the ability nor the motivation to perform these functions effectively. These were overcome as the Energy Secretariat increased its involvement in these stages of the project cycle.

This experience appears to be fairly typical of projects involving private sector proponents. Many lack the necessary skills to effectively carry out information transfer and have little incentive to inform potential competitors. More direct involvement of the implementing agency appears to be in order for such projects and the CREDA program is pursuing this approach.

ARENA RETROFITS

SUBPROGRAM: Retrofit

TECHNOLOGY: Heat recovery and lighting system modifications for ice arenas.

LOCATION: Saint-Leonard, Riverview, Lameque

OBJECTIVES: To demonstrate retrofit technologies applicable to the 84 community ice arenas in New Brunswick and confirm expected energy savings and paybacks.

TYPE OF DEMONSTRATION: Marketing

FUNDING BREAKDOWN:		
	New Brunswick	$ 27,535
	Canada	$ 110,140
	Three Municipalities	$ 45,000

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

The idea for an arena retrofit project was generated by the newly formed Enerplan Consultants Ltd. in April 1981. Enerplan approached the Energy Secretariat with Riverview Arena in mind. The Secretariat indicated an interest in such a project if three arenas with varying characteristics (but representative of most of New Brunswick's arenas) were included; there was considerable emphasis on achieving an "even" geographical distribution. Enerplan selected three arenas in consultation with the official of the provincial Department of Youth, Recreation and Cultural Services (DYRCS) who was responsible for arenas.

b. **Proposal Assessment**

The original proposal (which suggested demos at only two arenas) was received May 10/81 and reviewed by the Secretariat, CIC and DYRCS. DYRCS considered the retrofit measures proposed to be too extensive. A revised proposal for demonstrations at three arenas (containing more detailed provisions for monitoring and information transfer) was received June 17/81 and quickly sent to EMR for review. Management Committee approved the project July 16/81, with additional funds being added over the proposal estimates for monitoring ($12,600) information transfer ($2,500) and preparation of a final report and a more popularized arena retrofit manual ($4,700).

c. **Project Preparation**

The contract with Enerplan was signed 3 months after the date of approval. There appear to have been no problems during this phase.

d. **Project Implementation**

Construction

Construction proceeded smoothly -- the project manager's only real complaint was that the project signs were not put up in time for the construction phase. As a result, he felt, opportunities for information transfer during this phase were lost.

Monitoring

Considerable attention was given to monitoring. Metering and monitoring were carried out for the 1981/82 skating season prior to the retrofits because the arena records of energy consumption were

sketchy. Construction then took place during the summer of 1982 and monitoring of the retrofitted arenas was carried out during the 1982/83 skating season.

Reporting

A noteworthy feature of this phase was the provision for two types of final reports. Enerplan is responsible for producing a technical report aimed at a technical and engineering audience, while a freelance writer has been hired to write a less technical "arena retrofit manual" aimed at arena managers and municipal decision-makers.

Information Transfer

There has been considerable information transfer for this project even though the final report has not yet been received. Seminars were held to present preliminary findings in May/83 in Saint-Leonard, Moncton (Riverview) and Lameque, to which arena managers, consultants and municipal representatives were invited. DYRCS agreed to cover travel costs for arena and municipal representatives, and NEAP and AECIP also made presentations. NEAP also provided funding assistance. Attendance levels varied from 10 to 40; the Moncton seminar was attended by a delegation of 12 arena managers and municipal representatives from P.E.I. Attendees filled out questionnaires after the seminar, in which they were asked for their opinions on the seminar and their intentions to replicate. 79% of respondents indicated that they intended to take some action as a result of what they had learned at the seminars; the Secretariat intends to follow-up with these respondents to ascertain whether in fact they did take action and if not why not (i.e. identification of other barriers).

These seminars represent a good example of coordination between NEAP and CREDA in which information benefits are maximized and duplication minimized. Several other NEAP seminars are planned to integrate with CREDA project activities.

GENERAL OBSERVATIONS

This project is one of the best projects carried out under the New Brunswick CREDA, in that it meets more of the necessary preconditions for replication than most of the other projects. The involvement from the outset of the Department of Youth, Recreation and Cultural Services, which maintains regular contact with all the province's arenas, established a direct conduit to the target audience, which was clearly defined because of the specific nature of the technologies being demonstrated. The "market-oriented" approach is reflected in the two types of final report being produced -- the information produced from the demonstration is being tailored to the specific needs of different components of the target audience.

The project also had built in, through the seminars and questionnaires, an initial attempt to identify further barriers to replication. The time schedule of the project was realistic, and the project began early enough in the Program to avoid the pressures generated by external time constraints. This project is also a good example of cooperation and coordination between provincial government departments and, through the seminars, between CREDA and potential "follow-on" programs such as NEAP.

The results of the project are particularly interesting when viewed in the context of the original proposal assessment criteria. While the retrofits of all three arenas were successful in a technical sense, the economics were favourable only for the large Riverview arena. Paybacks relate to load -- large arenas such as Riverview operate up to 20 hours/day, 7 days/week, and retrofits can pay back in 2 to 3 years. The small arenas, however, such as those in Saint-Leonard and Lameque, are used much less intensively, and in

these arenas energy investments will require from 6 to 8 years to pay back. Thus the retrofit measures demonstrated are only likely to be replicated (in the foreseeable future) in arenas with long operating seasons and high levels of use.

ENERGY MANAGEMENT (CONNORS BROTHERS LTD)

SUBPROGRAM: Retrofit

TECHNOLOGY: Waste water and air heat recovery apparatus. Use of a programmable industrial controller to monitor and control electrical loads.

LOCATION: Black's Harbour

OBJECTIVES: To demonstrate energy management through the application of heat recovery technology and electrical load control to a fish processing operation; and to confirm expected energy savings and paybacks.

TYPE OF DEMONSTRATION: This project has elements of both technical and marketing demonstrations.

FUNDING BREAKDOWN:		
	New Brunswick	$ 26,000
	Canada	$ 104,000
	Connors Bros.	$ 52,000

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

This project was identified by Cogeneration Associates in CREDA Project #2018 (2 projects in the Food and Beverage Industry). Connors Brothers had already been visited twice by the "Energy Bus" and had carried out a number of no-cost and low-cost measures. As a result of the difficulty of convincing employees to carry out many of these measures, they were particularly interested in computerized control

systems. Cogeneration Associates prepared a proposal for Connors which was submitted in December of 1981.

b. Proposal Assessment

The Energy Secretariat appears from the outset to have viewed this project favourably. Approval was granted on the grounds that the project was technically feasible, economically attractive (simple payback of 2.8 years), had good project management and should have good follow-up potential at least in the 16 largest of New Brunswick 118 fish processing establishments. Management Committee appears to have agreed, because approval was given very quickly, in January 1982.

c. Project Preparation

The only noteworthy point at this phase was the incorporation into the contract of a high CREDA contribution (71%) "because of known financial difficulties of the industry in general". Thus the level of funding appears to have been tied to the financial status of the proponent rather than to the level of risk, which was low; this appears to have been due to a lack of confidence and thus a greater perception of risk within the industry. The contract was signed in May of 1982.

d. Project Implementation

Construction

Construction proceeded smoothly, and was finished on schedule in December 1982.

Monitoring

Much of the initiative in monitoring (a major component of the project) has been taken by the proponent. The computerized control system is probably the most important component of the demonstration from Connors' point of view.

Reporting

Submission of the final report was scheduled for July 1983. (A full year of monitoring was not necessary because the system is process related and not influenced by environmental factors).

Information Transfer

To date, information transfer on this project has been limited because data analysis has not been completed. Connors has produced a slide show and will provide tours on request. The final report has not yet been completed. Once it has been submitted, the Secretariat plans to hold a general heat recovery seminar, and perhaps also a more specific seminar on energy management for fish processors.

GENERAL OBSERVATIONS

An important question raised by this demonstration is that of further barriers to replication. CREDA contributed 71% not because the technology being demonstrated was risky, but because Connors Brothers, like other fish processors, is currently in a difficult financial condition. This raises serious questions about the potential for replication -- if Connors, the largest sardine packer in the world, required 71% funding, it is unlikely that smaller companies could undertake similar measures without assistance. The proponent made the point that AECIP is of little use to the fish industry

because it applies to investments of 3 to 7 years, and in this industry even a 3-year payback is considered unattractive when compared with competing non-energy investments.

WOOD CHIP HEATING SYSTEMS

SUBPROGRAM: Wood

TECHNOLOGY: Thermostatically-controlled automatic wood-chip stokers for residential and light commercial/institutional applications.

LOCATION: Fredericton

OBJECTIVES: "To demonstrate to a broad range of New Brunswick consumers that wood-chip heating systems are a viable alternative to present-day heating systems" is the objective cited in the Project Summary Sheet. However, the specific aim of the project appears to be the development and demonstration of a prototype residential wood-chip stoker for ultimate commercialization.

TYPE OF DEMONSTRATION: Given the high level of development work required, this should have been a technical demonstration. However, the installation in 5 homes (real world operational environment) introduced elements of a marketing demonstration.

FUNDING BREAKDOWN:

New Brunswick	$ 3,160
Canada	$ 12,640
Rundle Industries Ltd.	$ 6,700

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

This project was generated by Mr. Peter Rundle as a result of work being done at UNB with Energy Secretariat (not CREDA) funding on residential wood chip systems. Mr. Rundle was an entrepreneur looking for a product idea on which he could base a business, and saw a potential opportunity in residential wood chip heating equipment developed at UNB. According to the proponent, he was looking for "high risk capital" to develop a prototype wood chip stoker and knew of the CREDA program as a result of his contacts with the UNB researchers. He submitted a proposal in April of 1981.

b. Proposal Assessment

Rundle's original proposal covered the installation of 20 complete wood chip systems at various locations in the Fredericton area for 12 months of demonstration and performance evaluation. Energy Secretariat was concerned about UNB proprietary interests in the technology, so Rundle obtained assurances from Professor Marc Schneider that he could manufacture and distribute a wood chip unit with no financial demands from Schneider except possible royalty payments on the combustion bowl patent.

In a September 16/81 letter to the Secretariat, Rundle requested information on the status of his April proposal, and noted that Rundle Industries Ltd. had been formed and the name WOODCAN registered for the stoker unit. He also noted that a steel fabrication company had been lined up to produce and maintain the stoker, and that a sufficient source of residue-generated wood chips had been arranged to supply the demonstration project.

Further discussions ensued and Rundle submitted a scaled down proposal involving 5 units and a requested funding level of 70% of total project costs of $32,000. The proposal was forwarded to Ottawa and. Management Committee approval was obtained in January/82. Conditions of approval were that funding be reduced to $15,800 and 2 of the 5 units be installed in Woodstock.

c. **Project Preparation**

Most of the project preparation took place before the project was approved by Management Committee i.e. in the considerable modifications made to the original proposal. The contract incoporating these changes was signed in April of 1982. Most of the changes were aimed at scaling down the size of the project (the technology was not proven) and ensuring that a steady supply of fuel would be available and that it would not be generated from wood with a higher value alternate use.

d. **Project Implementation**

Construction

The development and construction of a finished prototype appears to have required much more time and money than was originally anticipated. According to the proponent, ten times the budgetted amount was ultimately spent on the testing and refining of the prototype. Much of this was fees for engineering assistance; this money was obtained through the mini-IRAP program of the National Research Council. The proponent noted in discussions that without the mini-IRAP assistance, he "would not have a saleable product".

Monitoring

The proponent appears to consider testing carried out in the development process to have been the main monitoring required for the project. Energy Secretariat plans for performance monitoring to be carried out during the 1983/84 heating season, although this could not be done fully given the March 31/84 deadline.

Reporting

The proponent intends to submit the final report in September 1983 as specified in the project contract. This report will obviously not contain the results of the monitoring being planned by the Secretariat. The Secretariat plans were based on the earlier assumption that work could continue until September 1984.

Information Transfer

Information transfer on this project has been directed toward the general public through brochures, open houses and displays at public events such as "Fredericton Firewood Days". Since the technology has broad potential application and no preliminary market studies were done early in the project, specific target audiences with greater potential for replication have not been identified in detail.

An interesting issue arose when the proponent had a unilingual product brochure printed which made no mention of CREDA, and claimed the brochure production costs from the project information transfer budget. The claim was not paid, because the brochure was a promotional item which bore no relation to the CREDA project, but the situation illustrates the desirability of including a contractual clause requiring Secretariat authorization prior to the production of information transfer material.

GENERAL OBSERVATIONS

This is a CREDA project from which a new industry may develop in New Brunswick. However, there is a need at this point for formal study of the potential market for the WOODCAN unit. Provision for such a study was not incorporated into the original proposal because at the time it was expected that a related project proposed by Enterprise Foundry (which included a market study) would proceed and that the one market study could serve two projects. However, the Enterprise project did not proceed and important market study thus remains to be done.

Another issue which this project raises is that of fuel supply. Rundle is currently concerned that he may have developed a combustion unit for which fuel may not be available. This project was, in fact, one of the motivating factors behind the development of the Wood Energy Subprogram.

This project does provide an example of the interaction of CREDA and another federal program (mini-IRAP).

INSTITUTIONAL ENERGY EFFICIENT RETROFIT

SUBPROGRAM: Retrofit

TECHNOLOGY: Heat recovery equipment, ventilation system modifications, revisions to domestic cold and hot water systems, modification of lighting systems, insulation of steam lines, computer based energy management system.

LOCATION: Mount Allison University, Sackville

OBJECTIVES: "To demonstrate that substantial savings in energy can be realized by retrofitting the energy related facilities of a typical university campus".

TYPE OF DEMONSTRATION: This is regarded as a "national demonstration" because of the comprehensiveness of the retrofit, the level of financial contribution involved, and the nature of the target audience. Given the proven nature of most of the technologies involved, it should be a marketing demonstration, and in certain respects is being conducted as such. However, as is discussed under "Information Transfer" below, not all the components of a marketing demonstration are present.

FUNDING BREAKDOWN:

New Brunswick	$ 160,000
Canada	$ 640,000
Mount Allison U.	$1,262,216

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

This project was generated by Enerplan Consultants Ltd., at a Management Committee meeting in January of 1982. A presentation by Enerplan on the arena retrofit project generated discussion on other potential retrofit projects. Enerplan had recently been the successful bidder on a call for proposals from Mount Allison to identify potential energy conservation measures for the campus, and suggested that the results of the study be implemented as a CREDA project. Management Committee responded positively because of the comprehensive nature of the project and its national focus. Also, it was felt that the university was typical of many small and medium commercial establishments in that it had virtually no metering of energy use (only one steam line and one electricity meter for 35 buildings) and hence staff had no idea of where energy could most effectively be conserved. It was also believed that the variety of buildings and services in the campus resembled a small town and that municipalities could therefore benefit from the demonstration.

b. Proposal Assessment

The proposal developed by Enerplan was submitted March 2/82. Since Management Committee had already approved the concept, for the reasons given above, formal approval was swiftly obtained the same month.

c. Project Preparation

The proposal submitted contained detailed provisions for monitoring and information transfer, so few changes were necessary during this phase. Certain retrofit measures with longer paybacks were funded under AECIP.

Contract deadlines were obviously influenced by external time constraints rather than by realistic scheduling: the completion date for information transfer is given as January 30/84, while the completion dates for the retrofit itself, monitoring and the final report are all the same -- March 30/84. This illogical scheduling gives rise to questions about the likelihood of the project being properly completed within the time frame of the Agreement.

d. Project Implementation

Construction

Construction proceeded smoothly and was regularly inspected by Energy Secretariat representatives.

Monitoring

Considerable effort and money had to be devoted to the installation of metering and monitoring equipment because of the lack of all but the most basic equipment on campus. Monitoring began in March of 1983 and should be continued until the end of the 1983/84 heating season to obtain effective results.

Information Transfer

A comprehensive information transfer plan has yet to be developed for this project; Enerplan plans to develop one in conjunction with the Secretariat. University personnel intend to present the results of the project at various regional and national university association meetings. A two-day NEAP/CREDA municipal energy conference in Moncton is being planned for March 1984. Mount Allison project information will be extensively disseminated at this conference.

GENERAL OBSERVATIONS

This is one of the largest projects undertaken by CREDA in New Brunswick, and has considerable national importance.

SURFACE-HEATED GREENHOUSE

SUBPROGRAM: Heat Recovery

TECHNOLOGY: Cascading of warm condenser water from a power plant over the outside surface of a glass-covered greenhouse to reduce its heating requirements.

LOCATION: Grand Lake

OBJECTIVES: To demonstrate the technical feasibility of the surface-heat concept and to verify reductions in energy requirements and operating costs.

TYPE OF DEMONSTRATION: Technical

FUNDING BREAKDOWN:

New Brunswick	$ 70,000
Canada	$ 280,000
N.B. Coal	$ 256,000
N.B. Power	$ 85,000
Canadian Electrical Association	$ 242,000

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

This project was generated by N.B. Coal, as a result of their desire to find uses for power plant waste heat. N.B. Coal commissioned a feasibility study of different means of using waste heat in greenhouses. The attraction of surface heating was that heated waste water could be used directly with no need to transduce the heat and thus capital costs were much lower. Two small pilot units were tested during the winter of 1981/82. At the same time a preliminary proposal was submitted to

the Energy Secretariat in November of 1981. In it, the greenhouse project and the waste heat aquaculture project were described as "a nucleus for a rapidly expanding waste heat utilization complex at Grand Lake".

b. **Proposal Assessment**

Energy Secretariat immediately forwarded the preliminary proposal to EMR for an opinion as to whether it was appropriate; EMR did not initially favour the project. Review by Agriculture Canada, however, led to a federal request that two ¼ acre greenhouses (one a control) be demonstrated rather than the single 1 acre greenhouse proposed. One acre is the minimum practical size for a commercial greenhouse; the scaling down was appropriate to the technical (rather than marketing) focus of the demonstration.

In January/82 Management Committee approved the project in principle if the scale was reduced and sufficient indication given of "how subsequent stages of the project will be handled and their viability". A revised proposal was submitted in March. EMR then expressed concern that the ultimate large project envisioned by N.B. Coal could force small independent greenhouse operators out of business and requested clarification of the reaction of the New Brunswick Greenhouse Growers Association to N.B. Coal entering the greenhouse business. Management Committee approved the proposal in late March/82 subject to the condition that the greenhouse facility be offered to the private sector at the end of the demonstration projects.

EMR appears to have been quite justifiably concerned by the fact that the demonstration could only be replicated by new greenhouse operations built adjacent to power plants. N.B. Coal argued that the proposed facility would be growing tomatoes, and would not be competing with existing growers because most tomatoes consumed in New Brunswick are imported. The demonstration was targeted at

greenhouse operators wishing to expand, at prospective greenhouse operators, and at utilities across the country. To reduce potential conflicts, N.B. Coal intended to meet regularly with a Committee of the New Brunswick Greenhouse Growers Association.

c. **Project Preparation**

The various questions raised during the proposal assessment phase were ultimately resolved when the conditions placed upon project approval were reduced to a requirement for the active involvement in the project of a person with commercial greenhouse operating experience and the New Brunswick Greenhouse Growers Association. The amount of money originally proposed for monitoring was also increased to $50,000. A contract was signed in October of 1982.

d. **Project Implementation**

Construction

Some delays were encountered because new methods had to be developed to deal with the problems encountered in building on settling ash lagoons. The solution to this problem resulted in a technical paper on methods of construction on ash lagoons.

Monitoring

A number of non-energy components (CO_2 level, plant growth, etc.) are being monitored to determine the impacts (if any) of surface heating on general greenhouse operation. Monitoring began in April 1983; the delay in start-up was due to equipment supply problems. While the contract appears to allocate only one month for performance monitoring, this is clearly unrealistic, and both the proponent and the Energy Secretariat wish monitoring to continue until March 1984.

Reporting

The proponent expects that three to four months will be required after the end of monitoring to write the final report, which would indicate a practical completion date of August 1984.

Information Transfer

A low profile has been maintained to date, but an official opening is planned for the fall of 1983. Information transfer to date has been informal, and little interest in the project has been manifested by New Brunswick greenhouse operators.

The information transfer planned appears to comprise a visual presentation, final report and a technical paper for presentation at agricultural or utility conferences. The Canadian Electrical Association will also act as a conduit for information transfer. It is clear, however, that transfer of final results will not be possible within the time frame of the Agreement since these results will not be available until mid - 1984..

GENERAL OBSERVATIONS

The schedule for this project was clearly too tight -- no time was left for "slippage", which occurred during both the construction and monitoring phases. The Secretariat had been proceeding under the assumption that work could continue under the Agreement until September 1984.

This is a good example of a classic technical demonstration -- low profile, small scale, heavily monitored for technical information. The information produced should therefore be targeted primarily at a technical audience, which appears to be the case.

This project, like the aquaculture project, raises a number of institutional issues regarding the sale and pricing of waste heat from power plants. These should be addressed as part of a marketing demonstration if market studies confirm the commercial potential of the concept.

It is interesting to note that a consortium of the 5 largest flower greenhouse operators in New Brunswick have approached N.B. Coal with a proposal to co-venture on a similar project. Currently the raising of flowers is much more profitable than the cultivation of vegetables. The growers believe that only when flower markets are saturated should any expansion in vegetable greenhouse operations be considered.

FISH OIL COMBUSTION

SUBPROGRAM: General Conservation

TECHNOLOGY: Modification of conventional combustion equipment to burn fish oil rather than Bunker C.

LOCATION: Black's Harbour

OBJECTIVES: To establish the combustion characteristics of fish oil and to test various mixtures of fish oil and Bunker C in modified conventional combustion equipment to determine the optimal mix for combustion.

TYPE OF DEMONSTRATION: Technical

FUNDING BREAKDOWN:		
	New Brunswick	$ 7,650
	Canada	$ 30,600
	Connors Brothers	$ 12,750

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

The idea for the project was generated by the energy manager of Connors Brothers. (Connors is one of the few fish processors large enough to be able to support a full-time energy manager). Fish oil had been mixed with Bunker C and burned on occasion for a number of years as a disposal method, but no accurate data were available on the combustion characteristics of fish oil. While Connors was aware that the economics of replacing Bunker C with fish oil were not favourable in New Brunswick (as they are in Newfoundland) they wished to do a proof-of-concept test so that the information would be on hand when it became economic to burn fish oil rather than sell it or in case of interruptions in oil supplies.

b. **Proposal Assessment**

Energy Secretariat received the proposal March 21/81 and the project was approved two days later at a Management Committee meeting.

c. **Project Preparation**

Conditions of approval stipulated that on-site tours and production of a bilingual brochure were to be included as part of information transfer activities proposed, and that the project manager was to liaise with CANMET and other federal agencies concerned with combustion technology. The contract was signed in September of 1982.

d. **Project Implementation**

Construction

A boiler was modified to burn fish oil once laboratory tests of the oil had been carried out by three independent labs. Fish oil was burned straight in a 2½ week run with no problems.

Monitoring

Monitoring of combustion efficiency was carried out during the 2½ week run, and tubes and controls were checked for buildups.

Reporting

The material has been assembled for the final report, but it has not yet been written, although it was due March/83. It is expected later in the year. (It should be noted that the Energy Secretariat has been appropriately flexible with respect to final report deadlines, particularly when the project managers have seasonally fluctuating workloads).

Information Transfer

Despite the fact that this was a technical demonstration and was conducted as such, this project has probably received more media coverage and generated more public awareness than any other CREDA project in New Brunswick. Articles have appeared in more than half a dozen newspapers and trade magazines, and the project manager has been interviewed by a number of radio and television stations. The novelty of the demonstration has generated a level of public interest that is far out of proportion to the significance of the demonstration.

Interest has apparently also been generated among potential replicators, as Connors has received inquiries from several of the largest Atlantic fish processors.

It is interesting to note that the original proposal submitted by Connors Brothers contained no provisions for information transfer. These were added during the project preparation stage. It is ironic that this technical demo has generated such interest, while the energy management demonstration at Connors Brothers has generated little interest among either the general public or potential replicators.

GENERAL OBSERVATIONS

This project has been very successful in achieving the objective of increasing public awareness, of one unconventional energy technology. It also successfully answered several technical questions about fish oil combustion. However, stabilization of world oil prices has decreased the likelihood of diffusion of the technology in New Brunswick in the near future. Connors is now using fish oil in place of Bunker C in Newfoundland, where the economics are already attractive and is planning to test fish oil in diesel engines to displace this more expensive fuel.

CONVENIENCE STORE RETROFITS

SECTOR: Retrofit

TECHNOLOGY: Insulation of walls and roof, installation of energy-efficient glazing and entrance doors, installation of new heating/cooling systems complete with control system and heat reclaim and retrofit of lighting systems.

LOCATION: Moncton, Saint John, Fredericton, Bathurst, Campbellton, Edmunston (proposed).

OBJECTIVES: To demonstrate feasible methods of reducing energy consumption in convenience stores.

TYPE OF DEMONSTRATION: Marketing. The technology is proven, the environment is operational and the wide geographical distribution is designed to give the demonstration a high profile.

FUNDING BREAKDOWN:

New Brunswick	$ 34,050
Canada	$ 136,200
6 store owners	$ 54,000
	($9,000 per store)

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

The idea for this project came from Enerplan Consultants Ltd. Originally only one retrofit -- in Moncton -- was proposed, but this was expanded to 6 at the request of the Energy Secretariat. The proposal was submitted in October of 1981.

b. **Proposal Assessment**

The Energy Secretariat was been quite instrumental in directing the development of this proposal, i.e. in expanding it to encompass 6 stores. The emphasis was placed on small independent stores on the grounds that convenience store chains have both the sophistication and wherewithal to carry out retrofits on their own once confidence was created through demonstration. Management Committee approved the project in April 1982.

The Enerplan proposal indicated that the retrofits proposed had a simple payback of 8.5 years, and indicated that an 80% CREDA contribution could reduce this to a more acceptable 2.5 years; it was stated quite clearly that 2 to 3 years was the maximum acceptable payback for private sector operations under prevailing economic conditions. The implications of these statements appear to have been ignored during proposal assessment. Clearly the measures being proposed for this marketing-type demonstration were not at all attractive economically according to the criteria used by the target audience to assess potential investments. It is difficult to understand Management Committee's approval of the project when it was clear that the potential for all but heavily-subsidized replication was minimal.

c. **Project Preparation**

Barriers to investment which were not foreseen at the proposal assessment stage have caused considerable problems in project preparation. Difficulty has been encountered in finding independent convenience store owners in each city who are willing to participate in the retrofits even with subsidy of 2/3 the project costs. Even at this level of subsidy, a store must be a certain minimum size and have a

certain minimum volume of sales to find the investment attractive. In the smaller towns such as Edmunston there are few such stores. The restriction of eligibility to independently owned and operated stores has increased the difficulty.

The fact that 6 stores still have not been identified more than a year after initial approval of the project may indicate that this demonstration, as currently designed, is not meeting the needs of its purported target market or that other barriers to investment are stronger than foreseen.

d. Project Implementation

Construction

Construction schedules have obviously been delayed as a result of the difficulty in finding stores to retrofit. The Moncton store has been successfully retrofitted.

Monitoring

Monitoring schedules are also delayed, but with tight scheduling it should be possible to meet them in 5 stores.

Reporting

The final report for this project is due March 31/84. It is obvious that to meet this schedule, the report will have to be incomplete in terms of the original intentions of the contract.

Information Transfer

Information transfer will likewise also suffer from the weaknesses manifested in the proposal assessment and project preparation phases. It is fairly clear that this demonstration does not meet the needs of its purported target audience -- it it did, one would expect to see much more enthusiasm for participation in the project. It is rather unlikely that meaningful information transfer can occur under these circumstances. In addition, time constraints will reduce the amount of information transfer that can take place under the Agreement as currently constituted.

GENERAL OBSERVATIONS

This project raises serious questions about the project selection criteria of both the Energy Secretariat and EMR. In the face of clear indications that the project would not meet the needs of its purported target audience, it was approved because of an apparent feeling among Secretariat staff that it should be done because it fit in with the overall retrofit plan and was needed. This in turn calls into question the relevance of that plan -- many of the sectors identified as "needing" retrofit demonstrations (e.g. convenience stores, restaurants, museums) may in fact not be appropriate targets for such demonstrations.

The Secretariat has preferred to rely on the judgement of its staff and on indicators from other programs such as the Energy Audit Program to determine needs for demonstrations in various sectors. Given the staff's intimate knowledge of the province, this may be a practical way of circumventing the need for expensive and time consuming market studies which would strain the resources of CREDA. However, the experience of this project suggests that increased attention should be given to more formal market study at least at the level of the subprogram when target sectors for demonstration are being identified. (Obviously, this suggestion is only applicable if CREDA is extended in some way).

WOOD RESIDUE SUPPLY AND DEMAND

SUBPROGRAM: Wood

TECHNOLOGY: Harvesting

LOCATION: Miramichi River Watershed

OBJECTIVES: To determine the availability of wood residues and the economics of harvesting them for fuel.

TYPE OF DEMONSTRATION: Feasibility study

FUNDING BREAKDOWN:	New Brunswick	$ 15,757
	Canada	$ 63,028

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

This project was generated by CREDA under the Wood Energy Subprogram. It was felt that there were serious gaps in information on exactly how much wood fuel could be produced from residues and at what cost, and that this information is vital to assessment of just how significant a contribution wood residues can make to New Brunswick's energy needs. This in turn influences how much effort CREDA and other government programs should put into encouraging wood energy use. Other aspects of the wood subprogram were felt to be progressing to the point where "equipment development and distribution systems will be at an acceptable level within two years while supply of raw materials is imprecise".*

* Memo from E.T. Owens to D. Curtis, dated Oct. 5/82.

In an attempt to fill this information gap, a request for proposals was issued August 31/82 to consultants in forestry and energy for a study of the supply and demand of wood residues in Department of Natural Resources Region #2. Proposals were submitted in October 1982.

b. **Proposal Assessment**

The winning proposal was submitted by a consortium consisting of ADI Ltd., Woodlot Services (1978) Ltd. and E.S. Fellows, Consulting Forester. A concern of the Energy Secretariat during the proposal assessment phase appears to have been that of time, because the schedule could only be met within the framework of the Agreement if fieldwork began in the fall of 1982.

Approval was obtained October 1982.

c. **Project Preparation**

Because this project was initiated by the Energy Secretariat, much of the planning and project preparation work had been carried out during the process of preparing the request for proposals. As a result, contract preparation was rapid, and the contract was signed December 16/82.

Since the project comprised a study rather than a demonstration, planning for monitoring was not relevant. Information transfer will take place through integration with the general Wood Energy Information Transfer Plan.

d. **Project Implementation**

Project work began upon receipt of approval in October 1982. Discussions were held with regional forestry and pulp industry

representatives to determine after what time period residues are inaccessible. to determine the population of current and previous cuts producing useful residues and to identify and plot the harvest areas to be studied. Field samples of residues were carried out and the results analysed over the winter months. A literature review of harvesting techniques and costs was carried out and a sampling system developed. The energy consumption of local industries and institutions was surveyed to determine the potential for conversion to wood residues.

The main fieldwork of the project began in May and will continue until July, after which harvesting and transportation cost estimates will be developed. The final report is expected in September 1983.

Throughout the project, ADI (the project managers) have maintained close contact with the Wood Subprogram Manager, and monthly progress reporting has been conscientiously carried out. The proponent commented that progress of the project had been greatly aided by the presence of a technically competent and experienced Wood Subprogram Manager, i.e. rather than merely overseeing the projects, the Manager is capable of providing valuable technical assistance as well.

GENERAL OBSERVATIONS

This project marks a change in the orientation of the New Brunswick CREDA program, especially the Wood Subprogram, toward more direction from the Energy Secretariat. It is the first major project which is basically a study rather than a demonstration; several other CREDA-generated studies have been approved since (e.g. Model Wood Energy Industry Feasibility Study of Neill and Gunter and OPIM). These studies represent a reaction of CREDA to information gaps which are not being adequately filled by other programs such as ENFOR. The information they provide is seen as a necessary precondition for the ultimate success of the demonstration projects being carried out in the Wood Subprogram. Thus CREDA appears to be moving

back along the R&D - to - commercialization continuum in order to address barriers to successful demonstrations.

Much of the information to be generated should be applicable to much of New Brunswick and parts of Nova Scotia and Quebec. The methodologies for development of true costs of harvesting and delivery should be widely applicable.

The study has also uncovered several potential barriers to the ultimate establishment of a wood residue industry. The main concern of a forestry contractor harvesting pulp or roundwood is that particular product. While study results to date indicate that removal of residues concurrently with merchantable wood will add only incrementally to his costs, the contractor is faced with the necessity to market a new product (i.e. fuel wood residues). The profit in doing so must be sufficient to make this additional activity attractive. ADI has been finding that the prices being quoted by potential suppliers of wood residues are considerably in excess of what potential industrial and institutional users are willing to pay. Even as potential suppliers appear to require substantial profit incentives, so potential users appear to require the prospect of a sizeable reduction in fuel costs before they will convert to wood -- a 5 to 10% reduction in fuel costs is apparently not a sufficient incentive. ADI has been experiencing considerable difficulty in bringing together potential suppliers and users of wood residues in the Miramichi region because of this problem.

This sort of barrier appears to be beyond the capacity of CREDA to address. The identification of barriers such as this is, however, relevant to a consideration of appropriate follow-on programs.

RESIDENTIAL RETROFIT

SUBPROGRAM: Small Scale

TECHNOLOGY: Conservation - Retrofit

LOCATION: Saint John

OBJECTIVES: To demonstrate the application of energy conservation techniques to a one hundred and forty year old dwelling. Principal techniques demonstrated include erection of a double wall with continuous vapour barrier, installation of a large bay window and insulated shutters. A major purpose of this project is, as it is for all the small scale projects, to increase general public awareness.

TYPE OF DEMONSTRATION: This appears to be primarily a marketing demonstration, in that many of the techniques being demonstrated are quite well proven.

FUNDING BREAKDOWN:

New Brunswick	$ 600
Canada	$ 2,400
D. Peters	not specified

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

The proponents are a young couple who purchased an old house in 1980. The idea for the retrofit sprung from the fact that the house was extremely cold in winter as well as being expensive to heat. The proponents thus planned to take some sort of action anyway, but could do a more comprehensive retrofit with supplemental funding.

b. **Proposal Assessment**

Like all the small scale proposals, this was first screened by the Research and Productivity Council (RPC) and then by the Energy Secretariat. The main concern of the proponent was the fact that acknowledgement of proposal receipt and notice of approval were delayed past the deadlines given in the original guidelines. While the time involved was short (one week) the proponent's lack of experience with government contracting caused him to ascribe more significance to the delays.

c. **Project Preparation**

The original proposal requested $2,596.57. This was increased to $3,000 to allow extra funds for information transfer.

d. **Project Implementation**

Construction

Construction appears to have proceeded fairly smoothly. The main complaint of the proponents was the lack of contact with RPC or the Secretariat. They had been led to believe that regular visits would be made every few weeks, but received only one visit from a summer student who advised on monitoring.

Monitoring

Simple monitoring of room temperatures and fuel consumption has been conscientiously carried out.

Reporting

Monthly reports have been submitted regularly. To date, the proponents appear to have received no guidelines or guidance on how to go about writing the final report.

Information Transfer

The first open house was held in January/83. No project signs were delivered, project summaries could not be provided by the Secretariat because they were still in production, and no representative of RPC or the Secretariat attended. The proponents made their own signs and produced a 2 page summary sheet. The openhouse was well attended (36 people) and a high level of interest appears to have been generated.

GENERAL OBSERVATIONS

This appears to be a well planned small scale project in which the proponents have conscientiously fulfilled their obligations. The techniques demonstrated could potentially be replicated in a large number of homes in the Saint John area.

The main problem appears to have been one of lack of communication. The proponents feel they have been ignored by the Secretariat because their project is not "glamorous" and demonstrates well-proven technology. Their complaints reveal that small scale proponents (who are generally inexperienced with government contracts) take very seriously all statements or promises made by government representatives, and ascribe great importance to personal contact. Such requirements can be expensive in terms of staff time relative to the magnitude of the project, however.

SOLAR ASSISTED HEAT PUMP

SUBPROGRAM: Small Scale

TECHNOLOGY: Solar Heating - Active

LOCATION: Moncton

OBJECTIVES: To demonstrate the heating of a residential dwelling with a solar-assisted heating system in conjunction with a heat pump.

TYPE OF DEMONSTRATION: This appears to have been more of a technical demonstration. There were a number of technical uncertainties involved, and information produced is being aimed primarily at a technical audience.

BREAKDOWN OF FUNDING:

New Brunswick	$ 1,600
Canada	$ 6,400
K. Cheney	Not specified

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

The proponent was interested in solar energy as a result of the involvement of his employer (Transport Canada) in the PUSH Program. He had been wanting to try solar energy in his own home but was constrained by the high capital costs involved. He applied to the CREDA small scale program after reading of it in a newspaper advertisement.

b. **Proposal Assessment**

The lengthy and detailed proposal submitted contained extensive technical data on each of the components: active solar system, heat pump, wood furnace, window quilts. System payback was estimated at 25 years.

The proposal was well prepared and met small scale assessment criteria with respect to management, diversity of technologies, etc. However, one must question if there is much merit in increasing general public awareness of technologies with paybacks far longer than most people would consider reasonable.

c. **Project Preparation**

Few changes were necessary, as the original proposal contained detailed and individually budgetted plans for monitoring and information transfer. The proposal had indicated that if CREDA could fund 80% of the $12,641 projected total cost, window quilts would be included, but that if the funding limit was $8,000, they would not. Funding was set at $8,000 and window quilts were not included.

Representatives of both the Secretariat and RPC visited the proponent during this phase to review his plans, verify who the subcontractors were to be, etc. The higher level of effort put into project preparation compared with the residential retrofit project described earlier appears to be due to the higher level of technical uncertainty involved in this project.

d. Project Implementation

Construction

Some delays were encountered due to initial malfunctioning of equipment, etc., but in general no major problems were encountered during construction. The proponent requested that his equipment layout be inspected before the system was hooked up, and was visited by two RPC representatives.

Monitoring

Detailed monitoring of the system appears to have been conscientiously carried out. The proponent has requested that the final report deadline be extended in order to allow him to complete a full year of monitoring.

Reporting

The proponent has been extremely conscientious in submitting monthly progress reports, and has included separate reports on monitoring data. No difficulties are anticipated in writing the final report.

Information Transfer

Signage was provided and the open house held in December was attended by RPC representatives as well as some 40 other people. The proponent made a special effort to invite classes from the Moncton engineering technology school and the majority of attendees were "technical people". According to the proponent the general response to the systems was "it's great as long as it's subsidized".

The proponent has also written an article for a Transport Canada newsletter which generated several enquiries. He intends to write

articles for more technical journals once further information is available.

GENERAL OBSERVATIONS

This project appears to have been well planned and managed. It has raised awareness, certainly, but the prospects of unsubsidized replication appear slim in view of the paybacks involved. Even though small scale projects are generally not accorded the same level of priority as larger projects and are subjected to a less rigorous proposal assessment process, one must question the allocation of public funds to a demonstration which is unlikely to result in replication. It has increased public awareness, but not public appreciation of conservation and renewable energy as practical and realistic options.

The level of attention this project has received from the Small Scale Subprogram managers contrasts sharply with that received by the residential retrofit project described previously, especially given that the retrofit project appears to have much greater potential for replication. More weight appears to have been given to considerations of technical novelty than to more practical considerations of cost-effectiveness.

GRID CONNECTED WIND GENERATOR

SUBPROGRAM: Small Scale

TECHNOLOGY: Wind

LOCATION: Canterbury

OBJECTIVES: To demonstrate the use of wind energy for the production of alternating current and to demonstrate interconnection with the utility grid.

TYPE OF DEMONSTRATION: This was a technical demonstration; there was a fair degree of technical uncertainty involved.

BREAKDOWN OF FUNDING:

New Brunswick	$ 1,210
Canada	$ 4,840
R. Farrell	Not specified.

PROJECT CYCLE HIGHLIGHTS

a. **Antecedents**

The proponent had been interested in wind energy for some time but was deterred by the high capital costs involved. After reading of the CREDA small-scale program in a newspaper advertisement he visited a wind energy authority in Maine and obtained sufficient information on available systems to decide on an appropriate generator and prepare a proposal to CREDA.

b. Proposal Assessment

The economic analyses contained in the proposal was based on an analysis by the Northern Maine Development Commission and estimated a 7 year payback period based on an average output of 400 kWh per month and a selling price to the grid of 4¢/kWh.

The main complaint of the proponent was that notice of approval was not received until one month after the date indicated on the application form. Once again, the proponent's inexperience with contracting procedures probably caused him to ascribe more importance to the delay than was warranted.

c. Project Preparation

During this phase, a wind consultant working for the Secretariat on interconnection policy visited the proponent to review the technical aspects of the project. He felt that the budget figure proposed was too low and as a result another $1,000 was added to the project funding. The consultant also drew up the monitoring plan for the proponent.

The project contract was signed August 4/82. A 30% advance was provided because of the substantial front end costs involved.

d. Project Implementation

Construction

A number of delays were encountered during construction, in part because of the inexperience of both the proponents and CREDA staff with the technology involved. The main problems, however, appear to have occurred at the interconnection stage. The New Brunswick Electric Power Commission was not particularly enthusiastic about the

project. The interconnection and installation of meters were not completed in time for the first open house, and N.B. Power unexpectedly charged the proponent for a pole and transformer. CREDA eventually covered this additional cost, but only after the proponent had had to pay it out of his own pocket.

Despite these difficulties, however, the project schedule was met.

Monitoring

Monitoring has been fairly trouble-free, probably because a proper plan had been developed during the project preparation phase. Equipment was provided by CREDA on a one-year loan. Anenometer malfunction has prevented accurate measurement of windspeeds for part of the project, however.

Reporting

The proponent appears somewhat unclear about how to proceed with writing the final report, and does not appear to date to have received much guidance on the subject from RPC.

Information Transfer

Information transfer to date has taken place principally through informal tours and an open house held in November/82. Neither project signage nor summary sheets were provided by CREDA, however, so that the only information the proponent had to give to visitors was manufacturer's literature. The proponent had advertised the open house quite widely in both New Brunswick and Maine newspapers and radio, and the majority of attendees were not local inhabitants.

GENERAL OBSERVATIONS

The data produced from this project indicate that the proponent's original estimates of average windspeeds were considerably overestimated. The relationship between wind speed and power output is such that the effect on output, and thus on payback, has been dramatic. The proponent now estimates that the payback period is in the neighbourhood of 45 years, rather than the 7 years originally predicted.

The problem encountered with interconnection raise questions about the advisability of funding grid connection projects (especially involving inexperienced private individuals) before a firm policy on interconnections has been put in place.

In the face of New Brunswick's low electricity rates, it appears unlikely that grid connected wind energy systems will be widely replicable. In fact, the application of electricity from any small-scale renewable source — be it wind, mini hydro or photovoltaics — appears likely to have potential only in off-grid applictions. This project has been valuable in illustrating a number of financial and institutional barriers to wind interconnect projects.

OPTIMIZED MICRO-HYDRO

SUBPROGRAM: Small Scale

TECHNOLOGY: Micro hydro

LOCATION: Sussex

OBJECTIVES: To demonstrate the operation of an optimized micro-hydroelectric power plant and the benefits to be derived from same.

TYPE OF DEMONSTRATION: This appears to have been primarily a technical demonstration in that it has included a considerable amount of design work and technical innovation, but information transfer appears to have been aimed at the general public as much as at a technical audience.

BREAKDOWN OF FUNDING:

New Brunswick	$ 1,600
Canada	$ 6,400
L. Danisch	$ 7,440

PROJECT CYCLE HIGHLIGHTS

a. Antecedents

The proponent of this project was already planning to install a micro hydro system in a small stream on his rural property when the CREDA small-scale program was advertised. However, financial assistance would enable him to put in a more complete system, so he prepared a proposal requesting $8,000.

b. Proposal Assessment

The proponent is an experienced graduate engineer and the proposal was well prepared. There was a desire to fund projects demonstrating a wide range of technologies; this appears to have been the best prepared proposal for a small hydro project and hence appears to have been approved quite readily.

The proponent noted that he was not informed of project approval until several weeks after the date originally given as the deadline for notification.

c. Project Preparation

Few modifications were made to the originally proposed plan of work. The main change was a compression of the construction schedule because of Energy Secretariat concerns that pipes would freeze. The contract was not signed until August of 1982 — the Secretariat wanted the proponent to begin work before the contract was signed, but he refused to do so.

d. Project Implementation

Construction

Construction and commissioning of the 150 watt system appears to have proceeded smoothly. The major problem appears to have been one of delays in payment.

Monitoring

Comprehensive monitoring of the efficiency throughout the system has been carried out. The turbine is a low-cost locally fabricated plastic

unit and the proponent was quite interested in monitoring its performance.

Reporting

No problems are anticipated in preparation of the final report, given the experience of the proponent. Progress reports have been sent in regularly.

Information Transfer

This project appears to have generated a considerable amount of media interest, being featured in a CBC television documentary on mini hydro, in radio interviews and newspaper articles. The proponent intends to prepare articles for energy-related publications once more data are available.

Two open houses have been held; for the first the proponent sent out news releases but for the second publicity was confined to newspaper advertisements. Attendance was good, but few visitors were interested in replicating.

GENERAL OBSERVATIONS

This project was well planned and well managed, and the proponent is happy with the performance of the hydro system, which is more convenient and reliable than the gasoline generators formerly used to provide power to his off-grid residence. However, he does not think there is much potential for replication in New Brunswick.

In the proponent's view, one of the major benefits of this project is its testing of a locally made turbine which could ultimately become the basis of a local industry. A number of these turbines have apparently been exported to California. The potential for sales within the province, however, appears to be low.

APPENDIX C

CREDA PROJECT AND PROGRAM STATUS

The status of approved projects and active proposals is summarized in Table C-1. The following categories have been used to roughly approximate the progress of each project:

A. Proposal preparation or assessment in progress.
B. Proposal awaiting Management Committee decision.
C. Project preparation in progress.
D. Project in early stages of implementation.
E. Project implementation well advanced.
F. Project monitoring ongoing.
G. Project documentation proceeding.
H. Project proceeding to subsequent phase.

X. Project inactive or "on hold".
Y. Project redirected or revised.
Z. New proposal being prepared.

Table C-2 summarizes the financial status of the approved projects as of May 31, 1983, while Table C-3 indicates commitments for proposals approved to date and summarizes non-project funding allocations and disbursements. Combining the information from the two tables indicates that some $8,849,044 of the $11,250,000 had been allocated as of May 31, 1983; of this, some $4,883,834 had actually been spent.

TABLE C-1

New Brunswick CREDA Project Portfolio as of May 31, 1983

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
A.	RETROFIT PROJECTS						
2016	"Kort" Nozzle	Mr. P. Legere	Ducted propulsion system for a wooden fish trawler	81/01 81/07	11,500	45%	G,H
2022	Energy Retrofit Information Transfer	Robbins Elliott	Seminars for transfer of information from retrofit projects		4,240		X
2027	Arena Retrofits	Enerplan Consultants Ltd.	Monitoring equipment, heat recovery and modified lighting systems	81/05 81/07	137,675	75%	G
2032	Energy Management	Connors Bros. Ltd.	Heat recovery from waste water and air; computerized load control	81/12 82/01	130,000	71%	F
2035	Institutional Energy Efficient Retrofit	Mount Allison University	Numerous energy conservation technologies	82/03 82/03	800,000	39%	F
2036	Commercial Energy Efficient Retrofit	Energy Secretariat	Numerous energy conservation technologies	82/02 82/03	47,400	100%	H
2042	Convenience Store Retrofits	Enerplan Consultants Ltd.	Insulation of walls roofs, energy efficient glazing, lighting system retrofit	81/10 82/04	170,250	76%	D

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
A. RETROFIT PROJECTS (Cont'd.)							
2044	Office Energy Efficient Retrofit	Design Workshop (N.B.) Ltd.	Insulation of walls to R20 roof to R40. Installation of heat pump and instantaneous hot water heaters	82/01 82/09	23,130	76%	F
2048	Energy Efficient Retrofit of Restaurants	Enerplan Consultants Ltd.	Various heat reclaim technologies	82/05 82/10	108,300	75%	D
2051	Co-op Housing Retrofit	Housing Alternatives Ltd.	Complete renovation of old city building into 17 apartments	82/11 83/03	130,400	19%	D
2052	Museums Retrofit	Enerplan Consultants Ltd.	Upgraded insulation, triple-glazed windows, air-lock entries, lighting & mechanical systems modifications	82/04 82/12	80,000	69%	D
4107	Energy Efficiency Plan-Fisheries	Energy Secretariat	Various projects in fisheries sector	82/09	231,000	100%	C
4112	Fire/Police Station	City of Dalhousie	Retrofit of municipal building	82/09			A
4113	Truck Fuel Economy	N.B. Department of Transportation	Modification to trucks & driving to increase fuel efficiency	82/09			A

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
A. RETROFIT PROJECTS (Cont'd.)							
4115	Church Retrofit	Grace Memorial United Church	Various retrofit technologies	83/02			A
4118	Air Sealing and Testing	N.B. Housing Corp.	Progressive sealing and testing of 170 housing units	82/10 83/05	255,000		C
4120	Municipal Building Retrofit	City of Saint John	Various retrofit technologies	83/02			B
4130	Municipal Building Retrofit	City of Moncton	Various retrofit technologies	82/10 83/05	85,000		C
4138	Moncton Hospital Retrofit	N.B. Department of Health	Various retrofit technologies	83/05			A
4140	Le Vieux Couvent						A
4141	SMI						A
4145	Residential Retrofit	Energy Secretariat	Extensive retrofit of 55 residences, with seminars training workshops; audits etc.		437,000		C
4149	Municipal Building Retrofit	Village of Atholville	Various retrofit technologies		15,000		C

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
B. HEAT RECOVERY PROJECTS							
4150	Municipal Building Retrofit	Village of Tidehead	Various retrofit technologies		17,500		C
2003	Waste Heat Aquaculture	Department of Natural Resources	Use of power plant waste warm water to accelerate rearing of salmon and trout	80/03 80/12	133,250	35%	H
2004	Energy Efficient Fish Hatchery	Mr. H. Wolverton	Heat reclaim, water reuse and low grade solar heat for use in commercial trout hatchery	80/05 80/12	63,000	80%	E
2010	Heat Recovery	Jiffy Products Ltd.	Installation of heat recovery equipment on warm air exhausts	80/08 81/01	48,360	39%	E
2018	2 Projects in Food/ Beverage Industry	Cogeneration Associates	Identification of 2 heat recovery projects in food and beverage industry	81/02 81/07	18,000	100%	E
2029	Cogeneration and Aquaculture	Department of Natural Resources	Use of condensate waste heat to warm water for fish hatchery	81/10 81/12	110,000	38%	F

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
B. HEAT RECOVERY PROJECTS (cont'd.)							
2037	Surface-heated Greenhouse	N.B. Coal	Cascading cooling water from power plant over outside of greenhouse	81/11 82/04	350,000	38%	F
2039	Combustion Test Facility	Research and Productivity Council	Establishment of a facility for demonstrating energy-efficient combustion equipment & retrofitting existing conventional combustion equipment	82/03 82/03	300,000	75%	E
2049	Ground Water Source Heat Pump	Deschennes Drilling Ltd.	2 water to air heat pumps -- one in domestic and one in commercial application	81/08 82/09	12,000	29%	D
2055	Swimming Pool Heat Recovery and Dehumidification	N.B. Department of Education	Swimming pool heat recovery	81/12 82/09	57,400	100%	F
2058	Heat Recovery in Police Station	City of Fredericton	Heat recovery technology for police station	82/ 83/03	16,000		C
4114	Ground Water Source Heat Pump	City of Fredericton	Ground water source heat pump for fire station heating	82/09			A

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
B. HEAT RECOVERY PROJECTS (cont'd.)							
4121	Hilmar Dairy Heat Recovery	Hilmar Dairy	Recovery of heat from milk for use in residential space heating	83/01			B
4147	Heat Recovery	Workmen's Compensation Board	Heat recovery from WCB buildings				A
4148	Heat Recovery	Scotia Textiles	Industrial Heat Recovery				A
4152	Waste Disposal/ Energy Recovery	Town of Sussex	Refuse incineration with heat recovery				
4153	Heat Pump - Thermal Storage	Red Cross	Heat pump				A
4154	Heat Recovery	Shediac Arena	Arena heat recovery				A
4158	Heat Recovery	Dairytown Products	Various heat recovery technologies for food industry				A

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
C.	GENERAL CONSERVATION PROJECTS						
2001	Conserver House	Conservation Council N.B.	Retrofit and operating budget for energy information centre	79/02 80/12	357,944	80% (est.)	H
2002	Commuter Vanpooling	N.B. Department of Transportation	To establish self-supporting commuter van pools	80/03 80/12	54,000	100%	E
2015	Energy Efficient Homes	Electrical League of New Brunswick			20,000		X
2017	Asphalt Recycling	Eastern Paving Ltd.	Hot recycling of reclaimed asphalt paving	81/02 81/07	75,000	62%	H
2025	Energy Education Project	N.B. Department of Education	Incorporation of 3 week energy course into grade 10 physical science course	81/02 81/08	19,475	100%	E
2030	Three Energy Efficient Houses	Crandall and Associates	Construction of 3 houses featuring insulated foundation walls, super-insulated walls and roof, air-to-air heat exchangers, tight windows and shutters	81/ 82/	40,435	31%	X

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
C.	GENERAL CONSERVATION PROJECTS (cont'd.)						
2040	Fish Oil Combustion	Connors Bros. Ltd.	Lab tests to establish combustion characteristics of fish oil, modification of burners, combustion testing of various mixtures	82/03 82/03	38,250	75%	G
2050	Energy Efficient Church (Dome)	St. Michael's Parish Church	Geodesic, 4 frequency Class I Alternate type dome	82/06 82/10	70,000	27%	D
4110	Municipal Energy Management	City of Fredericton	Information service for public awareness	82/11			A
4111	Poultry Waste Burner	Sussex Poultry	Combustion of poultry litter	82/10			A
4122	Car Pooling	N.B. Department of Transportation	Encouragement of car pooling	82/09			A
4125	Composting	City of Fredericton	Composting of municipal waste	82/03			B
4133	Hydrogen	Ste. Anne Nackawic Pulp & Paper	Use of by product hydrogen from chemical process				A
4146	Energy Efficient Co-op Housing	Cornerstone Co-operative	New energy-efficient construction				B

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
D. WOOD ENERGY PROJECTS							
2006	Wood Chip Burner	Department of Supply and Services	Wood chip fired boiler for space heating and hot water	80/06 81/07	170,000	63%	E
2013	Wood Chip Boiler	Maritime Forest Ranger School	Modifications to increase efficiency of existing wood chip fired boiler	80/08 81/01	39,450	75%	F
2014	Wood Chip Heating	Canadian Association for the Mentally Retarded	Installation of a wood chip burning boiler in an institutional establishment	80/10 81/01	22,000	80% (est.)	F
2021	Sawdust Burner	College Saint-Louis Maillet	Conversion of oil heated building to sawdust by installing heat exchangers connected to the existing central sawdust fired heating plant	81/02 81/07	15,000	17%	F

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
D.	WOOD ENERGY PROJECTS (cont'd.)						
2023	Wood Chip Harvesting	University of New Brunswick	Development of comprehensive methodology for implementing fuel chip harvesting, storage and distribution operations	80/01 82/01	225,000	83%	E
2024	Wood Chip Burner	Brookdale Nurseries Ltd.	Construction and installation of automatic fuel feeding and combustion equipment to allow use of wood chips as fuel in existing boiler	81/05 81/12	58,273	60%	F
2034	Wood Chip Residential Heating Units	Rundle Industries Ltd.	Development, construction and connection of five thermostatically-controlled wood chip stokers to existing oil-fired furnaces	81/04 82/01	15,800	70%	E
2043	Wood Chip Heating Belleisle School	N.B. Department of Education	Installation of new wood chip fired heating plant in a public school	82/06 82/09	85,000	63%	E

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
D.	WOOD ENERGY PROJECTS (cont'd.)						
2045	Determination of Supply and Demand of Wood Residues	ADI Ltd.	Evaluation of the amount of forest residue which can economically be extracted from the Miramichi region and determination of potential market	82/10 82/10	78,785	100%	E
2046	Wood Chip Boiler	Beth Shalom Inc.	Hot water furnace designed to burn sawdust, wood chips or wood shavings to heat three buildings currently heated by oil	82/04 82/11	68,000	80%	E
2047	Wood Residue Boiler (UNB)	Northeast Energy Services Ltd.	Installation of wood residue - burning boiler in existing steam plant	82/06 82/11	535,000	22%	D
2053	Model Wood Energy Industry Feasibility Study	Neill & Gunter Ltd. and OPIM Ltd.	Determination of viability of components of wood energy enterprises	83/01 83/03	50,000	100%	G

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
D.	WOOD ENERGY PROJECTS (cont'd.)						
2056	Integrated Harvesting/Wood Residue Production	Boise Cascade Canada Ltd.	Costs of and benefits of removing residue as well as merchantable timber in integrated harvesting operation	82/11 83/04	144,000	100%	C
2057	Hardwood/Softwood Residue as Biomass Fuel	Fraser Inc.	Costs of residue removal and processing	83/03 83/04	150,000	100%	C
4106	Thermal Fluid Boiler (Edmunston)	N.B. Department of Health	Installation of wood-fired thermal fluid boiler in new hospital	11/82	370,000 (tent)	36%	A
4135	Wood-Burning Facility	Royal Gardens	Use of wood to heat greenhouse				A
E.	OTHER "RENEWABLES" PROJECTS						
2005	Solar Assisted Hot Water Heating	N.B. Department of Education	Solar domestic hot water	80/06 81/07	22,500	100%	F
2007	Super Energy Efficient Senior Citizen's Cottages	United Church of Canada	Two super energy efficient cottages of 4 apartment; one with active solar (air) heating	80/06 80/08	62,564	17%	F

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
E.	OTHER "RENEWABLES" PROJECTS						
2009	Solar Hot Water Heating	Villa Providence	Solar domestic hot water heating in a nursing home	80/09 80/12	197,200	80%	E
2012	Cordwood Passive Solar Home	Mr. R. McRae	Passive solar heating and active solar hot water in energy efficient home	80/11 81/01	9,900	16%	G
2041	Utility Inter-connections	Marshall Consultants Ltd.	Consultancy on utility interconnect policy		15,000		H
2054	Anaerobic Wastewater Treatment	Lake Utopia Paper Ltd.	Anaerobic digestion of pulp mill effluent to methane, using bulk volume fermentor	82/03 83/01	400,000	33%	C
4103	Jiffy Peat Burner	Jiffy Products Ltd.	Installation of Lamb-Cargate wet cell burner modified to burn peat to provide heat for horticultural peat dryers	82/06			B
4119	Biogas for Pig Manure	OPIM Ltd.	Anaerobic digestion of pig manure to produce methane	83/01			B
4126	Peat Usage Study	Research and Productivity Council	Survey of potential peat uses in peat regions of New Brunswick	83/01			A

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
F.	SMALL SCALE PROJECTS						
101	Passive Solar Addition	A. Misener	Passive solar addition to existing house		7,952	35%	H
102	Energy Blanket	Key Industries	Insulation of domestic hot water heaters		6,000	100%	H
103	Solar Assisted Greenhouse	M. Beanlands	Attached greenhouse as passive solar collector		4,285	85%	E
104	Energy Efficient Home	J. Miller	Super insulation and passive solar		6,600	73%	G
105	River Source Heat Pump	R. Hirsch	Heat recovery		7,200	80%	F
106	Energy Projects Canada	Maclean Hunter Publishing	Information transfer		7,000		H
107	Ground Water Source Heat Pump	G. Arsenault	Heat recovery		5,900		
108	Wood Chip Trailer	M.L. Wilkins & Son	Wood		7,200		
201	Residential Retrofit	M. Visbach	Retrofit	82/ 82/06	8,000		E

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
F.	SMALL SCALE PROJECTS (cont'd.)						
202	Residential Retrofit	M. Holland	Retrofit	82/ 82/06	8,000		F
203	Residential Retrofit	D. Peters	Retrofit	82/ 82/06	3,000		F
204	Residential Retrofit	G. Niles	Retrofit	82/ 82/06	7,500		F
205	Residential Retrofit	T. Mersereau	Retrofit	82/ 82/06	8,000		F
207	Water-Air Heat Pump	K. Weisseneder	Heat Recovery	82/ 82/06	8,000		E
208	Water-Air Heat Pump	R. Gallant	Heat Recovery	82/ 82/06	5,600		F
211	Hybrid Electric Car	R. Rioux	Transportation/ Conservation	82/ 82/06	5,700		E
212	Air-Air Heat Exchanger	P. Powning	Heat Recovery	82/ 82/06	2,800		E

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
F.	SMALL SCALE PROJECTS (cont'd.)						
213	Commuter Electric Car	T. Sisk	Transportation/ Conservation	82/ 82/06	1,550		E
214	Energy Efficient Landscaping	J. Moore	Conservation	82/ 82/06	4,100		E
216	Wood and Solar Heated House	D. Power	Wood/solar	82/ 82/06	8,000		F
218	Gasified Wood Fuel	D. McKinney	Transportation/wood (wood-gas fired car)	82/ 82/06	6,500		F
219	Solar Assisted Heat Pump	K. Cheney	Wood/solar/heat recovery	82/ 82/06	8,000		F
220	Solar Data Collection and DHW	N.B. Community College, Edmunston	Solar	82/ 82/06	7,850		E
221	Tracking Solar Concentrator	W. Howe	Solar	82/ 82/06	2,500		F
222	Solar Space and Hot Water Heating	G. Adams	Solar	82/ 82/06	7,900		F

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
F.	SMALL SCALE PROJECTS (cont'd.)						
223	Solar Hot Water Heater	C. Collin	Solar	82/ 82/06	5,900		F
224	Solar Assisted Heat Pump	G. Caissie	Solar/Heat Recovery	82/ 82/06	8,000		E
225	Passive Solar Heated Room	T. Theriault	Solar	82/ 82/06	4,500		E
227	Ground Storage Solar Heat	P. La Combe	Solar	82/ 82/06	5,200		F
228	Trombe Wall	P. Calvette	Conservation	82/ 82/06	4,000		F
230	Wind Generated Space and Hot Water Heating	G. Glonet	Wind	82/ 82/06	8,000		F
231	Grid Connected Wind Generator	M. Noel	Wind	82/ 82/06	8,000		F
232	D.C. Wind Generator	L. Clifford	Wind	82/ 82/06	2,300		E

		Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
F.	SMALL SCALE PROJECTS (cont'd.)						
233	Grid Connected Wind Generator	R. Farrell	Wind	82/ 82/06	6,050		F
234	Optimized Micro-Hydro	L. Danisch	Micro-Hydro	82/ 82/06	8,000		F
	Water-Air Heat Pump	Little Rock Fisheries	Heat Pump	83/03 83/05	7,900		C
	"	H. Hooper	"	"	10,000		C
	"	N. Douglas	"	"	10,000		C
	"	M. Schofield	"	"	9,552		C
	"	M. Flewelling	"	"	7,240		C
	Exhaust Recovery -DHW	Paysan Restaurant	Heat Recovery	"	8,000		C
	Grey Water - DHW Preheat	G. Nimegeers	"	"	9,275		C

	Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
F. SMALL SCALE PROJECTS (cont'd.)						
Grey Water - DHW Preheat	D. Potter	Heat Recovery	83/03 83/05	7,000		C
Balloon Truss	D. Strang	New Construction	"	10,000		C
Truss	P. O'Hara	"	"	8,565		C
	W. McGrath	"	"	9,544		C
Info.Transfer on Balloon Construction	J. Amos	Balloon Construction	"	2,600		C
Dehumidifying Kiln	J. Waugh	Dehumidification	"	4,835		C
Shuttle Service	Saint John Parking Comm.	Transportation	"	10,000		C
Water Ram	J. Picard	Water Ram	"	2,350		C
Urban Electric Car	W. McKell	Transportation	"	7,000		C
Energy Management System	L. Danisch	Conservation	"	4,500		C

	Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
F. SMALL SCALE PROJECTS (cont'd.)						
Conservation Centre	Enerplan Consultants Ltd.	Retrofit	83/03 83/05	10,000		C
Conservation	Belzies Motel	Retrofit	83/03 83/05	7,700		C
Conservation	School Board #26	Retrofit	"	8,000		C
DHW and Space Heat	S. Robichaud	Wind	"	6,000		C
Whirlwind 4000/Interface	K. Daley	"	"	10,000		C
Waste Burner	P. LaCombe	Wood	"	10,000		C
Chip Loaf	J.R. Bedard	Wood	"	800		C
Photovoltaics	G. Wingate	Solar	"	5,711		C
Solar Kiln	School Board #27	"	"	8,000		C
Solarium	J. Schultz	"	"	6,575		C
Solarium	M. Riley		"	6,570		C

	Proponent	Demo Purpose/ Technology	Date Submitted/ Approved	CREDA Funding	Funding as % of Total Cost	Current Status
F. SMALL SCALE PROJECTS (cont'd.)						
Air Collectors	Allco Supply Ltd.	Solar	83/03 83/05	9,360		C
Solar Entrance	Central Weslyan Church	"		9,700		C
Solarium (Rock Storage)	A. Gregory	"	"	7,799		C
Solarium (Rock Storage)	A. Roy	"	"	7,375		C
Solar DHW	P. Garey	"	"	3,300		C
Pool Heat	G. Culbertson	"	"	3,474		C
DHW and Space Heat	E. Boutilier	"	"	3,250		C

TABLE C-2

Financial Status of Approved Projects as of May 31, 1983

Project	Project Description	Approved Funding To Date	Gross Eligible Claims To Date	Approved Funds Not Yet Claimed
	LARGE SCALE			
2001	Conserver House	$357,944	$265,008	$ 92,936
2002	Vanpooling - Dept. of Transportation	24,000	11,005	12,995
2003	Waste Heat Aquaculture - DNR	133,000	133,000	-
2004	Energy Efficient Fish Hatchery Harry Wolverton	63,000	56,821	6,179
2005	Solar Domestic Hot Water - Dept. of Education	22,500	20,314	2,186
2006	Wood Chip Burner - Dept. of Supply & Services	170,000	170,000	-
2007	Energy Efficient Cottages - United Church	66,062	61,911	4,151
2009	Solar Domestic Hot Water	197,200	180,254	16,946
2010	Heat Recovery - Jiffy Products	48,360	34,508	13,852
2012	Cordwood Passive Solar Home - R. McRae	10,349	9,209	1,140
2013	Wood Chip Boiler - Maritime Forest Ranger School	28,950	28,219	731
2014	Wood Chip Burner - Community Industries	22,000	20,540	1,460
2016	Kort Nozzle - Pamphile Legere	11,520	10,520	1,000
2017	Hot Recycling of Asphalt - Eastern Paving Ltd.	75,000	75,000	-

Project	Project Description	Approved Funding To Date	Gross Eligible Claims To Date	Approved Funds Not Yet Claimed
	LARGE SCALE (cont'd.)			
2018	2 Projects (Food/Beverage) - Cogeneration Associates	$ 18,000	$ 17,740	$ 260
2021	Sawdust Burner - Saint-Louis Maillet University	15,000	10,306	4,694
2022	Energy Retrofit Info. Transfer - Robbins Elliott	4,240	3,590	650
2023	Wood Chip Harvesting & Distribution - UNB	225,000	153,948	71,052
2024	Retrofit Wood Chip Burner - Brookdale Nurseries	58,273	56,143	2,130
2025	Energy Education Course - Dept. of Education	19,475	11,676	7,799
2027	Arena Retrofit - Enerplan Consultants	137,675	135,946	1,729
2028	Small Scale Demonstration (1) - RPC (2) - RPC	350,000 477,832	264,380 -	85,620 477,832
2029	Cogeneration & Aquaculture - DNR	110,000	110,000	-
2030	3 Energy Efficient Houses - Crandall & Assoc.	40,435	16,500	23,935
2032	Energy Management - Connors Bros. Ltd.	130,00	122,555	7,455
2034	5 Wood-Fired Heating Systems - Rundle Industries	16,896	14,710	2,186
2035	Energy Efficient Retrofit - Mt. A. University	800,000	780,381	19,619
2036	Johnston House Retrofit - Enerplan Consultants	47,400	35,300	12,100

Project	Project Description	Approved Funding To Date	Gross Eligible Claims To Date	Approved Funds Not Yet Claimed
	LARGE SCALE (cont'd.)			
2037	Surface Heated Greenhouse - NB Coal	$350,000	$308,778	$ 41,222
2039	Combustion Testing Facility - RPC	300,000	92,740	207,260
2040	Fish Oil Combustion - Connors Bros. Ltd.	38,250	34,963	3,287
2041	Utility Interconnections - Marshall Consulting	15,000	13,267	1,733
2042	5 Convenience Stores (Retrofit) - Enerplan Consultants	170,250	38,690	131,560
2043	Wood Chip Heating - Dept. of Education	85,000	3,000	82,000
2044	Commercial Energy Retrofit - Design Workshop	23,130	10,855	12,275
2045	Wood Energy Supply & Demand - ADI	78,785	31,864	46,921
2046	Wood Chip Heating - Beth Shalom Inc.	65,000	63,978	1,022
2047	Wood Residue Boiler - Northeast Energy Serv.	535,000	474,191	60,809
2048	Restaurants Energy Retrofit - Enerplan Consultants	108,300	9,971	98,329
2049	Ground Water Source Heat Pump - Deschenes Drilling	12,000	12,000	-
2050	Energy Efficient Church - St. Michaels Parish	70,000	59,309	10,691
2051	Co-op Housing Retrofit - Housing Alternatives	130,400	84,739	45,661

Project	Project Description	Approved Funding To Date	Gross Eligible Claims To Date	Approved Funds Not Yet Claimed
	LARGE SCALE (cont'd.)			
2052	Museums Retrofit (3) - Enerplan Cons.	80,000	4,293	75,707
2053	Model Wood Energy Industry Feasibility Study (Energy Secretariat - Neill & Gunter Ltd.)	50,000	25,737	24,263
2054	Anaerobic Wastewater Treatment - Lake Utopia Paper Ltd.	400,000	-	400,000
2055	Swimming Pool Heat Recovery & Dehumidification - Dept. of Education & Enerplan Consultants	57,400	-	57,400
2056	Integrated Harvesting/Wood Residue Production - Boise Cascade Canada	144,000	-	144,000
2057	Hardwood/Softwood Residue as Biomass Fuel - Fraser Inc.	150,000	-	150,000
2058	Heat Recovery in Police Station - City of Fredericton	16,000		16,00
	TOTAL LARGE SCALE	$6,588,625	$4,077,859	$2,480,767

Project	Project Description	Approved Funding To Date	Gross Eligible Claims To Date	Approved Funds Not Yet Claimed
	SMALL SCALE (non-subprogram)			
101	Passive Solar Addition - Adeline Misener	$ 7,952	$ 7,952	$ -
102	Thermal Blanket - Key Industries	6,000	5,838	162
103	Attached Greenhouse - Beanlands & Stewart	4,258	1,982	2,303
104	Energy Efficient Home - John Miller	6,600	4,662	1,938
105	River Source Heat Pump - Robert Hirsch	7,200	5,000	2,200
106	Energy Projects Canada - MacLean Hunter Publishing	7,000	-	7,000
107	Ground Water Source Heat Pump - Gertrude Arsenault	5,900	-	5,900
108	Wood Chip Trailer - M.L. Wilkins & Son	7,200	-	7,200
	TOTAL SMALL SCALE (non-subprogram)	$ 52,137	$ 25,434	$ 26,703
	TOTAL ALL	$6,610,763	$4,103,293	$2,507,470

TABLE C-3

Committed Funds and Non-Project Expenditures as of May 31, 1983

Number	Description	Approved Funding	Disbursements To Date	Remaining Approved Funds
4149	Building Retrofit Village of Atholville	$ 15,000	$ -	$ 15,000
4150	Energy Efficient Building - Village of Tide Head	17,550	-	17,550
4107	Fisheries Energy Demonstration	231,000	-	231,000
4145	Residential Retrofit Program	437,000	-	437,000
4118	House Tightening and Testing	255,000	-	255,000
4130	Municipal Building Retrofit-Moncton	85,000		85,000
	SUBTOTAL	1,040,550	-	1,040,550
	ADMINISTRATION	1,041,731*	780,541	261,190*
	PERFORMANCE MONITORING	56,000	-	56,000
	INFORMATION TRANSFER	100,000	-	100,000
	TOTAL	$2,238,281	$ 780,541	$ 1,457,740

*These figures are estimates.

TABLE C-4

Proposals Undergoing Federal Review as of May 31, 1983

Proposed Project	Subprogram	Recommended Funding
Heat Recovery - Scotia Textiles	Heat Recovery	137,000
Heat Recovery - Workmen's Compensation	Heat Recovery	155,000
Hilmar Dairy Farm	Heat Recovery	22,000
Waste Incineration - Sussex	Heat Recovery	180,000
Municipal Building Retrofit - Saint John	Retrofit	29,530
Thermal Fluid Boiler Edmunston Hospital	Wood	450,000
Energy Efficient Co-op Housing - Cornerstone	General Conservation	101,200
Jiffy Peat Burner	Other "Renewables"	1,340,000
Biogas from Pig Manure	Other "Renewables"	15,000
		$ 2,519,730

APPENDIX D

COMPLEMENTARY FEDERAL PROGRAMS

APPENDIX D

COMPLEMENTARY FEDERAL PROGRAMS

Energy from the Forest (ENFOR)

ENFOR is a major federal government initiative aimed at substituting petroleum based energy with that derived from forest biomass. Its objective is to generate the knowledge and technological basis that will permit a 10% contribution from forest biomass to the nation's total primary energy production by the year 2000.

The program is administered in two segments: the Biomass Production segment, which deals with forest-oriented matters such as inventory, growth, harvesting, transportation and environmental impacts; and the Biomass Conversion segment, which is concerned with the transformation of raw material into energy, fuels and chemicals.

The program is conducted almost entirely by contracting research, development and demonstration projects to outside agencies and individuals.

Industrial Research Assistance Program (IRAP)

This program encourages applied research in Canadian industry. Its objective is to increase the calibre and scope of industrial R&D in the Canadian business environment.

The program pays the salaries of individuals working on approved projects together with a company's share of standard fringe benefits. The participating company provides the remainder of the support, usually the equivalent of the IRAP contribution. The recipient firm is responsible for performance of research and the commercialization of results. Companies are required to undertake the exploitation of the research results in Canada and they retain all rights to the research results.

IRAP can also assist firms that are too small to be able to maintain a viable research effort out of their own resources but require an injection of new technology to solve technical problems. This is accomplished by paying the salaries of individuals in other research organizations subcontracted to solve these problems. Federal contributions to this aspect of the IRAP program were $2.5 million of the $25 million contribution to IRAP in 1980/81.

All companies incorporated either provincially or federally in Canada and engaged in activities, based to a significant extent on technology derived from the physical and life sciences and engineering, may apply.

Industry Energy Research and Development Program (IERD)

The IERD program encourages research and development of new and improved processes and equipment that will reduce energy consumption in industry. The program is part of a larger joint industry/government conservation program coordinated by the Federal Department of Energy, Mines and Resources.

Contributions of up to 50 per cent of the total estimated cost of approved projects are provided.

Energy Research and Development (ERD)

The National Energy Program provides for substantially increased federal expenditures on energy research and development (R&D) in the following areas:

- Research on gasoline alternatives and commercialization of results.
- Increased efficiency of energy use, in all sectors of the economy;

- New energy sources - ranging from coal (where technology must provide the key to environmentally safe use) to hydrogen, a promising future option.

R&D expenditures under the National Energy Program are allotted by the Department of Energy, Mines and Resources through the Office of Energy Research and Development to managers in existing federal research organizations, who in turn contract out to Canadian industry.

Agricultural Engineering Research and Development (AERD)

The Agricultural Engineering Research and Development Program (AERD) seeks to improve such areas as mechanization and energy utilization by farmers and assists Canadian industry to increase agricultural engineering R&D efforts.

Funds are provided for proposals solicited through the Science Procurement System of the Department of Supply and Services. Proposals can be made in response to advertised general program priorities for specific requirements or at the initiative of the proposer who recognizes a previously unmet need for specific work.

Enterprise Development Program (EDP)

EDP provides assistance to manufacturing and processing sectors in three ways:

- insurance of up to 90% to lenders when normal financing is not available for manufacturers to become more competitive by restructuring their operations;

- contributions up to 75% (max $200,000) for research, development and design projects;

- contributions up to 75% for market feasibility studies, productivity enhancement studies, and product development.

Small and medium-sized businesses are eligible. Application is through regional offices of Industry Trade and Commerce.

Development and Demonstration of Resource and Energy Conservation Technology (DRECT)

In cooperation with municipalities the DRECT program helps the private sector develop and demonstrate equipment, systems or products designed to recover or otherwise save energy through resource recovery.

This program supports development and construction of demonstration or prototype installations. Criteria for funding assistance principally include environmental protection benefits and energy conservation, but other benefits to Canada are also considered.

Any business offering appropriate proposals through the Department of Supply and Services may apply.

Remote Communities Demonstration Program (RCDP)

RCDP provides financial support for studies of remote community energy planning, for project implementation purposes and for promotion of feasible off-oil opportunities available to remote off-grid communities. The first phase of each project usually consists of a set of planning studies.

Program for Industry/Laboratory Projects (PILP)

This program facilitates the application and use of government and other non-industrial research results and know-how to Canadian industry. It is directed to cases which appear to represent significant industrial opportunities and in which the initial uncertainities inhibit unaided development by industry. The budget in 1980/81 was $11.7 million.

The program provides government financial and technical assistance in applying the results of government and other non-industrial research to the development of new products and processes. Where a preliminary project is needed, a consultant company or an organization with suitable staff and test facilities (e.g. a hospital) may be considered as a recipient. Specific projects are formulated by industry in cooperation with an appropriate agency and pursued under contribution agreements.

Canadian companies demonstrating the financial, managerial, technical, manufacturing and marketing capability to succeed with the project, either alone or in arrangements with others, are eligible for assistance.

Housing Technology Incentives Program (HTIP)

Assistance is available from Canada Mortgage and Housing Corporation for the development and implementation of new ideas related to the building or rehabilitation of housing.

Funds of up to $10,000 are available for ideas that increase the utility or performance of housing through improvements in design, construction or products. Energy conservation and housing rehabilitation are priorities. Proposals must produce a practical demonstration and have the potential to meet the National Building Code and Residential Standards.

Accelerated Capital Cost Allowance (ACCA)

This incentive program is an accelerated capital cost allowance designed to encourage business and industry to reduce energy waste, to decrease dependence on oil and to switch to renewable energy sources.

It is a "fast write off" mechanism applied to machinery and equipment which form part of a system as listed in Class 34 of the income tax regulations. Eligible assets that save energy or use renewable energy resources can be written off over three years: 25% in the first year, 50% in the second and the balance in any subsequent year. Equipment used to generate electricity at small hydro sites, heat recovery equipment and active solar equipment are examples of eligible assets. The capital cost of equipment and its installation, retrofitting as well as new installations for industrial processes, production equipment or individual services for commercial and institutional buildings are all applicable under the program.

Atlantic Energy Conservation Investment Program (AECIP)

The purpose of AECIP is to complement existing Atlantic province programs that encourage energy conservation in industry and commerce.

The program provides grants to finance portions of energy conservation investments made by industrial and commercial establishments and by non-government institutions, all of which have a specified minimum annual energy bill. The grants are provided to a maximum of 50% of eligible capital costs to reduce payback to three years. The program does not cover projects with a payback of less than three years or more than eight years.

Eligible projects include:

- industrial process changes to conserve energy;

- retrofit of buildings (HVAC, controls, lighting, insulation);
- waste heat recovery and utilization;
- co-generation projects.

Canada Oil Substitution Program (COSP)

This program consists of grants to help cover the costs of converting space and water heating equipment in homes and businesses from oil heating to heating with natural gas, propane, renewable resources such as wood solar and wind, and electricity (if produced mainly from non-oil sources). Grants range up to 50 percent of approved conversion costs to a maximum grant of $800. Owners of eligible property may apply.

Canadian Home Insulation Program (CHIP)

This program assists owners to improve insulation in their homes.

A taxable grant is provided, in all provinces except Prince Edward Island and Nova Scotia (ref. HIP program for these two), of 100% of the cost of materials up to a maximum of $350 and one-third of labour costs to a maximum of $150 for single dwellings in Canada, constructed before 1961. Some small apartment buildings are also eligible for this assistance. Weatherstripping, caulking and ventilation materials are accepted under the program. Owners of eligible accommodation may apply.

Forest Industry Renewable Energy (FIRE)

FIRE is a capital-cost-sharing program that encourages the substitution of mill and forest residues for purchased energy in the forest industry.

Financial incentives are provided for the conversion of facilities or the installation of new facilities using waste forest biomass or pulp mill effluents. The aim is to reduce dependence on non-renewable resources. Contributions of up to 20% of capital costs are provided for approved projects.

Applications are received from forest industries willing to provide energy production facilities using mill and forest residues in place of energy produced from non-renewable fuel sources.

Industrial Energy Management Program (IEMP)

This is a co-operative program with the Industry Task Forces to help all manufacturing companies reduce energy costs by providing technical information, training sessions and related materials.

Using a budget of $240,000, workshops for Chief Executive Officers and technical personnel will be held over a two year period. Booklets such as:

- "Energy Performance Measurement"
- "Energy Planning and Management Guide"
- "Energy Conservation Products Source Manual"

have also been provided.

Commercial Sector Task Forces (CTF)

The objective of this program is to develop a data base of energy consumption in various commercial building sectors, to act as an information dissemination medium, to increase energy awareness, to assist technology transfer, to act as a bridge between the sector and government and to identify constraints to energy conservation.

The approach of this program is to assist voluntary sectors to form task forces to collect data about their sector energy use, organize workshops, provide educational material and generally achieve the overall program objectives.

There are presently four task forces operating: Health Care Facilities, Office Buildings, Hospitality Industry Buildings, and Universities and Colleges. Two more will start in 1983: Schools and Retail Buildings.

Industrial Sector Task Force (ITF)

In 1975, Industry agreed to establish energy conservation task forces for their major energy using sectors. There are presently 16 task forces operating. Their functions are to:

- exchange information among member firms on opportunities for and means of achieving more efficient use of energy;
- set and report on targets for improvements in energy efficiency;
- serve as a focal point for government/industry discussions on the energy situation and on obstacles to conservation.

The Government provides financial support for the administration of the programs as well as technical information, bulletins, training and workshops. The other programs of this division of EMR grew out of this Task Force Program.

National Energy Audit Program (NEAP)

The objective of this program is to assist industrial and commercial establishments to identify areas of energy waste and to plan and implement corrective measures administered through Federal/Provincial agreements.

The program provided $40M over the three years from 1981/82 to 1983/84 on the basis of 80/20 cost sharing with the ten provinces. The program is administered, promoted and monitored by the provinces. The earlier Energy Bus program has been integrated with NEAP. On-site energy audits (Energy Bus) are conducted and follow up is provided through Consultant Advice Grants.

All industrial and commercial establishments and institutions are eligible for the energy audits. Federal, provincial or municipally owned institutions are not eligible, however, for the follow up Consultant Advice Grants.

Purchase and Use of Solar Heating (PUSH)

PUSH is a program of purchases of solar equipment by the federal government for its own use. The program helps increase the use of solar energy equipment and strengthens a new, regionally distributed, manufacturing industry. PUSH encourages the use of solar hot water and space heating systems in both new and existing federal government buildings, and in those owned by Crown corporations. Any producer of solar equipment may apply.

R-2000

The program assists in the construction of energy efficient housing units. It provides funding assistance to design, construct and evaluate houses; train builders and tradesmen; supervise construction; publicize and promote the demonstration; and maintain records of the construction process and energy performance of the houses once occupied. Any builder may apply. The program is administered by the Housing and Urban Development Association of Canada (HUDAC).

CANERTECH

CANERTECH is a Canadian Crown corporation concerned with the marketing and manufacturing of conservation and renewable energy technologies. CANERTECH assists Canadian businesses engaged in this field by undertaking initiatives such as joint ventures and equity investments, and through commercialization and marketing. It may also enter into shared ventures with energy corporations established by provincial governments, or undertake commercial production independently. Firms with interest in conservation and renewable energy technology may apply.

An important spinoff of Canertech for the Atlantic Provinces is Canercon, a subsidiary developed to finance energy conservation audit and retrofit in the commercial, small industrial and institutional sectors.

In early 1983 Canercon set up joint ventures with New Brunswick engineering firms to implement conservation projects in the targetted sections. Canercon will provide the majority of financing as well as all engineering and retrofit work required by the client firm interested in implementing cost effective conservation options. The Canercon financing package will require payback only from energy savings occurring from the retrofit and will therefore provide an attractive package for commercializing conservation projects within the private sector.

Federal Internal Propane Conversion Program

The purpose of this program is to set an example and to demonstrate the feasibility of large scale vehicle conversions by converting the Federal Government's own vehicles to propane whenever practical. The current goal is to overhaul 8,000 of the 22,000 vehicles in the government fleet (excluding combat vehicles).

District Heating Detailed Engineering Design

District Heating is the provision of hot water from a central boiler or a source of waste heat to heat family housing units or commercial buildings. The absence of a well-documented demonstration of district heating in Canada prevents municipalities or utilities from introducing systems of this nature. Further obstacles are high design costs and the considerable risk that may be involved. This program is intended to encourage the development of district heating.

Funding up to a maximum $1 million to conduct detailed engineering designs for sites and the implementation of district heating systems in the Atlantic region is available.

Builders or public utilities such as power corporations and gas utilities are eligible.

Energy Systems Analysis (ESA)

Cost-effective and energy-efficient building design has been shown to be achievable through energy analysis by computer using the ESA series of programs. Through this program the government encourages the use of energy-efficient designs.

To simulate energy conservation in commercial buildings, the government has made the ESA programs available to Canadian users. Any Canadian design engineer may apply.